U. S. DEPARTMENT OF ENERGY

SOLICITATION FOR FINANCIAL ASSISTANCE APPLICATIONS (SFAA) NO. DE-SC02-98EE50526

RESEARCH AND DEVELOPMENT FOR FUEL CELLS, DIRECT INJECTION ENGINES, AND FUELS: ENERGY EFFICIENCY AND RENEWABLE ENERGY TECHNOLOGY FOR TRANSPORTATION AND BUILDINGS

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U.S. DEPARTMENT OF ENERGY
Chicago Operations Office
9800 South Cass Avenue
Argonne, IL 60439

August 14, 1998

To: Prospective Applicants

SUBJECT: SOLICITATION FOR FINANCIAL ASSISTANCE APPLICATION (SFAA) NO. DE-SC02-98EE50526 FOR RESEARCH AND DEVELOPMENT FOR FUEL CELLS, DIRECT INJECTION ENGINES, AND FUELS: ENERGY EFFICIENCY AND RENEWABLE ENERGY TECHNOLOGY FOR TRANSPORTATION AND BUILDINGS

Executive Summary Letter

This letter is a summary of the salient elements of the Financial Assistance Solicitation, also called Solicitation for Financial Assistance Application (SFAA), but is not an integral part of the SFAA. Should there be any conflict between this Executive Summary Letter and the SFAA, the data and information in the SFAA shall prevail.

The Department of Energy (DOE), Office of Advanced Automotive Technologies (OAAT), Office of Energy Efficiency and Renewable Energy, invites applications for federal assistance for research and development for fuel cells, direct injection engines, and fuels: energy efficiency and renewable energy technology for transportation and buildings.

It is anticipated that cooperative agreements will be awarded under the three topic areas identified in Appendix A, B, and C of this solicitation.

Significant items of interest concerning the SFAA are:

1. **QUALIFICATION CRITERIA**

Cost Sharing - Cost sharing requirements vary with the topic area and are detailed in the appendices. Applications not meeting the minimum cost sharing requirements specified in the appendices will be eliminated from further consideration and will not be technically evaluated. Also see Section 1.4 of the SFAA for information on cost sharing.

Multiple Applications - There is no limitation on the number of different applications an applicant may submit. However, each application shall cover only one topic area (Topic 1, 2, or 3) identified in the appendices. An application which addresses more than one topic area will be eliminated from further consideration and will not be technically evaluated. See Section 1.2 for more information on multiple applications.

2. **Section 2306 of the Energy Policy Act (EPAct)** - Applicants other than those described in Section 501(c)(3) of the Internal Revenue Code that are seeking financial assistance under this Program Announcement are subject to the eligibility requirements of the Energy Policy Act. See Section 1.3 of the SFAA.

3. **Preapplication** - DOE encourages the submission of a preapplication before the preparation of a full application. The preapplication should consist of no more than two pages covering the areas identified in Section 2.1.

4. **Technology Transfer** - The Fuel Cell Program and this SFAA have a restriction on transfer of fuel cell technology to foreign entities. See Section 1.3 of the SFAA.

5. **Protection of Application Information** - DOE's policy is to use data included in applications for evaluation purposes only and to protect such information from unauthorized use or disclosure. Applicants are cautioned that certain proposal material may become subject to the Freedom of Information Act, as amended. The use and disclosure of such data may be restricted, provided that the Applicant marks the cover sheet of the proposal and each page containing restricted data with the term "Confidential Proprietary Information." See Section 1.11 of the SFAA.

6. **DOE National Laboratories** - DOE National Laboratories are not eligible to respond directly to this SFAA nor may they participate as a team member or subcontractor under any proposal. Applications from DOE Laboratories, or applications which include a DOE National Laboratory as a team member or subcontractor, will not be evaluated.

DOE Financial Assistance Regulations, 10 CFR Part 600, and guidance documents can be accessed on the DOE Financial Assistance Home Page at: "http://www.pr.doe.gov/fahome.html".

Electronic submission (telegraph, facsimile, or Internet) of preapplications or applications is not authorized. Preapplications and applications shall be submitted in writing to:

John K. O'Keefe, Executive Secretary
Solicitation No. DE-SC02-98EE50526
Closing Date and Time: _____
U.S. Department of Energy
Chicago Operations Office
9800 South Cass Avenue, Building 201, Room 3D-06
Argonne, IL 60439-4899

External markings for preapplications and applications shall cite the above mailing address and the closing date and time. Any questions concerning this solicitation must cite the solicitation number and be addressed in writing by mail to the above mailing address, or by electronic transmission to Internet address: **john.o'keefe@ch.doe.gov**

NOTE: Preapplications are due no later than 3:00 p.m. local prevailing time on August 27, 1998 and full applications are due no later than October 7, 1998 by 3:00 p.m., local prevailing time, at the address shown above.

Sincerely,

Mona L. Bradford, Chairperson
Source Evaluation Panel

TABLE OF CONTENTS

APPENDICES

SOLICITATION FOR FINANCIAL ASSISTANCE APPLICATION NO. DE-SC02-98EE50526 FOR RESEARCH AND DEVELOPMENT FOR FUEL CELLS, DIRECT INJECTION ENGINES, AND FUELS: ENERGY EFFICIENCY AND RENEWABLE ENERGY TECHNOLOGY FOR TRANSPORTATION AND BUILDINGS

1. PROGRAM DESCRIPTION

1.1 INTRODUCTION

In the United States of America, the use of automobiles and light trucks accounts for 40% of the total petroleum consumption. The transportation sector relies on petroleum for 97% of its energy and nearly half of this comes from foreign sources, which has energy security implications. In addition, environmental concerns are pushing us toward changes in our transportation system. Ground-level smog and carbon monoxide (CO) are major problems in several U.S. cities. Highway road vehicle emissions account for about 27% of man-made volatile organic compound emissions, 32% of nitrogen oxide emissions, and 62% of CO emissions on an annual basis in the USA. New emission regulations, including Federal Tier 2 and California's Air Resources Board (CARB) standards, will require radically new approaches incorporating the latest in energy and propulsion system technologies.

Seven federal agencies and the United States Council for Automotive Research (USCAR) are collaborating under the Partnership for a New Generation of Vehicles (PNGV) initiative. A goal of PNGV is to develop highly efficient light-duty vehicles by the year 2004 that achieve up to three times (3X) the fuel economy of comparable conventional vehicles, lower than the proposed Federal Tier 2 standards, and offer the same level of performance and cost as today's vehicles. Direct injection engines and fuel cells have been selected for their potential for attaining the goal of 80-mpg fuel economy in a six-passenger sedan.

The Department of Energy (DOE), through this financial assistance solicitation, is inviting proposals for research and development (R&D) on automotive fuel cells and direct injection engines in support of PNGV. DOE is also seeking proposals for R&D on fuel cell technologies for buildings applications in support of the DOE Office of Energy Efficiency and Renewable Energy fuel cell cross-cutting technologies and for R&D on fuel infrastructure. A major DOE program objective is to increase the involvement of the automotive industry and buildings industry supplier bases in key engine-related and buildings-related R&D programs.

Topic 1 includes research on proton-exchange-membrane (PEM) fuel cells for transportation and buildings. Proposals for light-duty transportation applications are sought in three areas and building applications in two areas:

Fuel Cells for Transportation

- Fuel cell system integration issues, including delivery of complete sub-scale fuel cell power systems; one to DOE for experiments to validate fuel cell system models, another for use at the recipient(s) laboratory facilities to develop engineering solutions for operation at extreme conditions while ensuring water balance and demonstrating freeze-thaw capability. DOE also seeks to update existing cost analyses incorporating the principles of design for manufacturability.

- Fuel cell component R&D, including development of CO tolerant anodes, higher activity cathodes, manufacturing technologies, air compressor/expanders, controls and sensors, coolants, stack sealants, gaskets, and adhesives for stack durability.

- Fuel processing R&D, including CO clean-up and design for manufacturability of preferential oxidation system(s), start-up and transient response, durability, and innovative ideas for reducing size, weight, and cost of the fuel processing system.

Fuel Cells for Buildings

- Advanced components are required for PEM fuel cell cogeneration systems that are simple in construction with no heavily loaded mechanical subsystems that limit life and reliability; operate at a pressure of 1.5 atm or below; have heat rejection temperatures in excess of 100□C to provide access to a broad range of applications for cogeneration systems and reduce the cost of heat rejection when operating in a power only mode; and are highly reliable during long-term operation on natural gas reformate from low-cost fuel processors. PEM fuel cell technologies based on polymer membranes (perfluorinated sulfonic acid) or similar materials as an electrolyte are unlikely to meet these system requirements. The Fuel Cell for Buildings Program seeks to support research and development of advanced high temperature membrane(s) with performance equal to or better than the state-of-the-art membranes.

- Proposals are sought for the design phase (Phase I) of a three-phase program leading to a field demonstration of an integrated 50 kW PEM fuel cell power system for light commercial building cogeneration applications. Only Phase I participants selected through this SFAA will be eligible to compete for the subsequent Phase II. Successful completion of Phases I and II will be a prerequisite for progression to Phase III.

Topic 2 includes research in three areas: (1) compression-ignition direct injection engines (CIDI), (2) spark-ignition direct injection engines (SIDI), and (3) innovative concepts. The primary

technical barrier facing automotive DI engines is the development of combustion and emission control technology able to reliably meet stringent emission regulations.

- The focus of the CIDI engine research is on NO_x and particulate matter (PM) emissions control technology for light-duty vehicle applications. Emission control component development includes research on advanced after-treatment technologies that will enable PNGV-candidate CIDI engines (operating on low-sulfur diesel fuel) and SIDI engines (operating on reformulated gasoline) to meet NO_x and PM emissions targets (0.2 g/mi NO_x and 0.01 g/mi PM) as well as other requirements (e.g., cost and efficiency). Examples of components being sought are advanced fuel injection systems (high-pressure, rate shaping) and exhaust gas recirculation in combination with after-treatment approaches such as lean NO_x catalysts, non-thermal plasma, and regenerative particulate traps.

- The focus of the SIDI efforts will be on development of the fuel delivery/mixing subsystem to meet established technical goals.

- Proposals are sought for innovative, high-risk research into novel means of reducing emissions or improving the efficiency of CIDI and SIDI engines.

Topic 3 consists of research on one area of fuel infrastructure.

- Research and development is sought for the design and construction of a small-scale, low-pressure, natural gas reformer system as part of a hydrogen refueling system for PEM fuel cell vehicles. In addition to the reformer, the refueling system should contain a hydrogen purification system, hydrogen compressor, stationary hydrogen storage system, and dispensing apparatus for refueling fuel cell vehicles.

1.2 QUALIFICATION CRITERIA

Cost Sharing - Cost sharing requirements vary with the topic area and are detailed in the appendices. Applications not meeting the minimum cost sharing requirements specified in the appendices will be eliminated from further consideration and will not be technically evaluated. Also see Section 1.4 of the SFAA for information on cost sharing.

Multiple Applications - There is no limitation on the number of different applications an applicant may submit. **However, each application shall cover only one topic area** (Topic 1, 2, or 3). DOE will not assign a topic area to applications. This must be done by the applicant. When an application has relevance to more than one topic, the applicant must decide which topic is the most relevant and submit the application under that topic only. One application can address multiple subtopics within a Topic; however, each subtopic must be clearly identified in each application. An application which addresses more than one topic area will be eliminated from further consideration and will not be technically evaluated.

1.3 ELIGIBILITY AND LIMITATIONS

Any non-profit or for-profit organization, university or other institution of higher education, or non-governmental agency or entity is eligible to apply; further, an unaffiliated individual is also eligible to apply.

DOE National Laboratories are not eligible to respond directly to this SFAA nor may they participate as a teaming member or subcontractor under any proposal. Applications from DOE Laboratories, or applications which include a DOE National Laboratory as a team member or subcontractor, will not be evaluated.

In addition to the conditions and instructions contained in Section 2. of this solicitation, the following eligibility conditions and limitations apply:

Section 2306 of the Energy Policy Act (EPAct) - Applicants, other than those described in Section 501(c)(3) of the Internal Revenue Code, that are seeking financial assistance under this solicitation are subject to the eligibility requirements of EPAct.

Technology Transfer - Considering the objectives of this program, the applicants shall give preference to technology transfer activities specifically directed toward the development of U.S. based manufacturing capability in all activities relating to technology developed under this SFAA except as may otherwise be agreed by DOE consistent with program objectives and adequate recognition of DOE's contributions to the technology.

Domestic Work Effort - In order to foster U.S. competitiveness in these technologies, it is desired that >90% of the total work effort be conducted in the United States. The total work effort includes work performed by subcontractors and consultants.

Applications Being Considered for Other Funding - If an application submitted in response to this solicitation contains a significant amount of essentially equivalent work as one that has been previously funded, or is pending at, or about to be submitted to another federal agency, or to other DOE programs as a separate action, the applicant must so indicate and provide the information required by Section 2.5.5. If an award is made pursuant to an application submitted under this solicitation, the applicant will be required to certify that neither the applicant nor any of its employees have previously been or are currently being paid for essentially equivalent work by any agency of the Federal Government.

1.4 COST SHARING

For the purpose of this solicitation, cost sharing is defined as a percentage of the total cost of the proposed project. For example:

Total Cost of Project	$150,000.00
Participant's Share 25%	37,500.00
Government Share 75%	112,500.00

Cost sharing requirements are specified in Appendices A, B, and C of this solicitation and the minimum cost sharing specified in the appendices for each subtopic proposed must be met for the project. In the event a project is terminated early or not funded to its completion, the applicant will be held liable to DOE for the minimum cost share requirements under the Energy Policy Act (EPAct) (20% for research and development; 50% for demonstration or commercial application) for the effort performed as of the date of termination. Cost share varies according to the level of technology development risks and potential for applicant's gain in intellectual property. Typically, projects that involve system or subsystem risk require the most cost share by the participant. Projects that involve component development of innovative concepts require less cost share by the participant.

An application that fails to meet the required cost share amounts set forth in the solicitation will not be considered for award.

The types of cost sharing permitted are described in the DOE Financial Assistance Regulations 10 CFR 600.123 and 600.224. All cost sharing must be fully auditable and verifiable and is subject to DOE acceptance.

Fee or profit will not be paid to any applicant or subcontractor under this SFAA. Foregone fee or profit may not be considered in establishing the extent of cost sharing.

1.5 TEAMING

Teaming arrangements are strongly encouraged, especially among fuel providers, engine manufacturers, catalyst suppliers, and component suppliers to take advantage of the best complementary technologies available from the different companies/organizations. Participation of universities and small businesses is also encouraged. Teaming arrangements of this sort help to facilitate timely technology transfer to the private sector and enhance U.S. industrial competitiveness.

1.6 FACILITIES/PROPERTY

Applicants are expected to provide all necessary personnel, facilities, special test equipment, and materials to complete the proposed project and are encouraged to utilize existing facilities to the greatest extent possible. Facilities and/or property for accomplishing the research and development will not be provided by the Department of Energy.

1.7 AWARDS

Awards made pursuant to this solicitation will be made using a Cooperative Agreement instrument. A sample is provided as Appendix Q.

DOE expects to award approximately twenty (20) cooperative agreements resulting from this solicitation in accordance with DOE Financial Assistance Regulations appearing at Title 10 of the Code of Federal Regulations, Chapter II, Subchapter H, Part 600 (10 CFR 600). Under Topic 1, approximately fourteen (14) awards will be made, with periods of performance ranging from eighteen to thirty months, with total estimated DOE funding of $10,000,000 to $30,000,000. Significantly fewer awards may be made if an award(s) covers more than one subtopic area. Under Topic 2, there will be approximately five (5) awards, with periods of performance of thirty months, with total estimated DOE funding of $40,000,000. It is anticipated that there will be one (1) award under Topic 3, with a period of performance of thirty-six months, with total estimated DOE funding of $2,500,000.

DOE reserves the right to fund in whole or in part, any, all, or none of the applications submitted in response to this solicitation. This solicitation does not obligate DOE to make any awards. All awards are subject to the availability of funds.

DOE expects to make selections for award on or about February 1, 1999. Cooperative agreements are expected to be awarded on or about May 1, 1999.

DOE is under no obligation to pay any costs associated with preparation or submission of preapplications/applications if an award is not made. If an award is made, such costs may be allowable as provided in the applicable cost principles (see 10 CFR 600.127 and 600.222).

1.8 REGULATORY INFORMATION

No funding will be available under the DOE Minority Economic Impact (MEI) loan program, 10 CFR Part 800, to finance the cost of preparing a financial assistance application.

Review under E.O. 12372, “Intergovernmental Review of Federal Programs” is not required.

The statutory authority for this program is the Energy Policy Act of 1992 (Public Law 102-486, as amended by Public Law 103-437) and the U.S. Department of Energy Organization Act (P.L. 95-91).

The Catalog of Federal Domestic Assistance (CFDA) number is 81.111.

The applicable DOE Financial Assistance Regulations are 10 CFR Part 600. These regulations and guidance documents can be accessed on the DOE Financial Assistance Home Page at: “http://www.pr.doe.gov/fahome.html”.

NOTICE REGARDING ELIGIBLE/INELIGIBLE ACTIVITIES

Eligible activities under this program include those which describe and promote the understanding of scientific and technical aspects of specific energy technologies, but not those which encourage or support political activities such as the collection and dissemination of information related to potential, planned or pending legislation.

COMPLIANCE WITH BUY AMERICAN ACT

In accepting this award, the recipient agrees to comply with sections 2 through 4 of the Act of March 3, 1993 (41 U.S.C. 10a - 10c, popularly known as the "Buy American Act"). The recipient should review the provisions of the Act to ensure that expenditures made under this award are in accordance with it.

LOBBYING RESTRICTIONS (DEPARTMENT OF INTERIOR & RELATED AGENCIES APPROPRIATIONS ACT, 1998)

The contractor or awardee agrees that none of the funds obligated on the award shall be made available for any activity or the publication or distribution of literature that in any way tends to promote public support or opposition to any legislative proposal on which Congressional action is not complete. This restriction is in addition to those prescribed elsewhere in statute and regulation.

NOTICE REGARDING THE PURCHASE OF AMERICAN-MADE EQUIPMENT AND PRODUCTS -- SENSE OF CONGRESS

It is the sense of the Congress that, to the greatest extent practicable, all equipment and products purchased with funds made available under this award should be American-made.

SIMPSON-CRAIG AMENDMENT

Applicant organizations which are described in section 501(c)(4) of the Internal Revenue Code of 1986 and engage in lobbying activities after December 31, 1995 shall not be eligible for the receipt of Federal funds constituting an award, grant, or loan. Section 501(c)(4) of the Internal Revenue Code of 1986 covers:

> "Civic leagues or organizations not organized for profit but operated exclusively for the promotion of social welfare, or local associations of employees, the membership of which is limited to the employees of a designated person or persons in a particular municipality, and the net earnings of which are devoted exclusively to charitable, educational, or recreational purposes."

As set forth in section 3 of the Lobbying Disclosure Act of 1995, as amended, (2 U.S.C. 1602), lobbying activities are defined broadly to include, among other things, contacts on behalf of an organization with specified employees of the Executive Branch and Congress with regard to

Federal legislative, regulatory, and program administrative matters. Applicants qualifying as described in section 501(c)(4) of the Internal Revenue Code of 1986 must fill out representation at Appendix H.2.

1.9 PRINCIPAL INVESTIGATOR

The Principal Investigator (PI) should be knowledgeable in all technical aspects of the application and be capable of leading the research effort. Other key personnel should be knowledgeable in the relevant technical aspects of the research efforts.

Since the PI will serve a major role in the project, the following rules shall apply to any substitution in PI after the closing date of the solicitation: (1) after the closing date, but prior to the award selection, no substitution in PI will be considered; (2) for applications selected for funding, but prior to award, any proposed substitution in PI will be viewed as a substantial change in the original application and no award will be issued unless DOE expressly approves the substitution; and (3) during the term of the cooperative agreement, any change in the PI will require prior written approval by DOE.

1.10 INTELLECTUAL PROPERTY

A. Patent Rights

1. For large businesses, the Government normally takes title to all inventions conceived or first actually reduced to practice under a DOE agreement. In this case, because of the anticipated cost-sharing, DOE expects to waive title to such inventions to the recipient, subject to the Government's usual license, march-in, and U.S. preference provisions comparable to 35 USC 203 and 204. Additionally, DOE's patent waivers will include a U.S. competitiveness provision reflecting the programmatic objectives of the program, i.e., improving the competitive position as well as U.S. employment opportunities.

2. Domestic small businesses and nonprofit and educational organizations will have the right to elect to retain title pursuant to 35 USC 200 et seq.

B. Rights to Technical Data

1. The Government has unlimited rights in technical data created under the agreement. Delivery or licensing of technical data developed solely at private expense will not normally be required except as specifically negotiated in a particular agreement or as may be negotiated as a condition of a patent waiver to insure continued development toward commercialization of an invention arising under a DOE agreement.

2. In this program, it is anticipated that DOE will be able to withhold technical data created under the program for up to five (5) years from the time it is created under the Energy Policy Act. This will be addressed on a case-by-case basis for each agreement considering the technology involved, etc. After the five (5) year time period expires, such data is subject to release if it is a Government record.

1.11 PROTECTION OF APPLICATION INFORMATION

DOE's policy is to use data included in applications for evaluation purposes only and to protect such information from unauthorized use or disclosure. Information contained in unsuccessful applications will remain the property of the applicant. Copies will not be returned to the applicant. Public release of information in any application submitted will be subject to existing statutory and regulatory requirements, e.g., Freedom of Information Act.

In addition to Government personnel, scientists and engineers from outside the Government will be used in the evaluation process. In designating outside evaluators, DOE will take into consideration requirements for the avoidance of organizational and personal conflicts of interest and the competitive relationship, if any, between the applicant and the prospective outside evaluator. The evaluation will be performed under an agreement with the evaluator that the data contained in the proposal will be used only for evaluation purposes and will not be further disclosed. **Submission of an application constitutes consent for its review by outside evaluators.**

1.12 DEFINITIONS - RESEARCH AND DEVELOPMENT

Research and development means all research activities, both basic and applied, and all development activities that are supported at universities, colleges, and other non-profit institutions and commercial organizations. "Research" is defined as a systematic study directed toward fuller scientific knowledge or understanding of the subject studied. The term research also includes activities involving the training of individuals in research techniques where such activities utilize the same facilities as other research and development activities and where such activities are not included in the instruction function. "Development" is the systematic use of knowledge and understanding gained from research directed toward the production of useful materials, devices, systems, or methods, including design and development of prototypes and processes.

2. PREAPPLICATION AND APPLICATION PREPARATION INSTRUCTIONS AND FORMAT

2.1 PREAPPLICATION REQUIREMENTS, LIMITATIONS AND FORMAT

DOE encourages the submission of a preapplication before expending extensive effort in preparing a detailed application or submitting any proprietary information to DOE. However, failure to submit a preapplication does not preclude anyone from submitting a full application. The preapplication should consist of no more than two pages covering the following areas:

Project Title
Principal Investigator and Subcontractors/Collaborators
Solicitation Project/Topic area/subtopic area
Background
Objectives
General Approach
Approximate Schedule
Approximate cost and sources of funding for each proposed phase
Offeror name, address, telephone, and fax number
Name, title, and signature of Offeror's Certifying Representative

An original and two copies of the preapplication should be submitted to the address specified in Section 5.1. See Appendix D for the preapplication format.

After completion of the preapplication review, DOE will issue a letter, approximately two weeks after receipt of the preapplication, to each applicant indicating either a favorable or an unfavorable response. However, an unfavorable response does not preclude anyone from submitting a full application. DOE will not provide any further information, e. g. advice or guidance, to an applicant on a subsequent application in connection with the preapplication.

2.2 APPLICATION REQUIREMENTS

The financial assistance application to DOE in response to this SFAA should provide sufficient information to convince DOE, and members of the research community who review the application that it is responsive and that the proposed work represents a sound approach to the investigation of an important scientific or engineering question. The application should concentrate on research that will contribute to proving scientific or technical feasibility of the approach or concept.

The quality of the scientific or technical content of the application will be the principal basis on which applications will be evaluated. A financial assistance application should be self-contained and written with the care and thoroughness accorded papers for publication. Each application should be reviewed carefully by the applicant to ensure inclusion of data essential for evaluation using the checklist provided in Appendix S.

The DOE technical objectives for Topics 1, 2, and 3 are provided in Appendices A, B, and C, respectively.

The research must be responsive to the DOE technical objectives and should also serve as the basis for technological innovation and new commercial products or processes.

Any consultants identified in the application must have agreed to serve in the manner and to the extent described in the application. A letter of commitment signed by the consultant certifying

his/her availability, role, and salary must be submitted as part of this application. See Section 2.5.2 (c).

All physical facilities, equipment, instrumentation, and consultants identified in the application must be available for the research or R&D project. If any instrumentation, equipment, and/or physical facilities to be used are not the property of the applicant, and are not to be purchased or leased for this project, their source must be identified and their availability specifically confirmed in the application.

If the application is selected for an award, the cooperative agreement may not be awarded unless all of the above items are provided.

Applications must be signed by the Principal Investigator and by an individual who is authorized to commit the applicant's organization to the terms and conditions of the cooperative agreement, if awarded. Principal Investigators are not generally authorized to act on behalf of their institutions (Note: Items No. 15 and 16 of the DOE Form 4650.2, "Face Page," as set forth at Appendix E, require completion).

2.3 PROPRIETARY INFORMATION

If proprietary information is provided in an application that constitutes a trade secret or confidential commercial or financial information, it will be treated in confidence, to the extent permitted by law. The applicant should clearly mark each page that contains such information with the term "Proprietary Information." The Government will limit dissemination of such information to individuals within official channels who have a need to know.

2.4 GENERAL CONTENT AND LIMITATIONS

This financial assistance solicitation is designed to reduce the investment of time and cost to firms in preparing a formal application. Those who wish to respond should submit a financial assistance application of no more than **25** consecutively numbered pages stapled together (to be submitted in one volume), including Face Page, project abstract, and main text, except as specifically excluded in section 2.5. The pages should be of standard 8-1/2" x 11" size (21.6 cm x 27.9 cm), with 1" margins around the top, bottom, and sides, and printed on both sides. For proportionally-spaced fonts, the type can be no smaller than 12 point, and for non-proportionally-spaced fonts, the type can be no smaller than 12 characters per inch (elite). For interpretation page guidelines, the front and back of a single sheet are counted as two pages. **An original application (to be submitted in one volume) and six (6) copies should be submitted.**

There is no limitation on the number of different applications an applicant may submit. **However, each application shall cover only one topic area** (Topic 1, 2, or 3). DOE will not assign a topic area to applications. This must be done by the applicant. When an application has relevance to more than one topic, the applicant must decide which topic is the most relevant and submit the application under that topic only. One application can address multiple subtopics within a Topic; however, each subtopic must be clearly identified in each application. An application which

addresses more than one topic area will be eliminated from further consideration and will not be technically evaluated.

The application should be direct, concise, and informative. Promotional and non-project-related discussion is discouraged. To meet DOE requirements, all items listed in Section 2.5 are to be covered fully and in the order set forth.

2.5 APPLICATION FORMAT

Each application submitted must *contain all certifications and documents required under Section 2.5.*

2.5.1 Introductory Pages

a. Face Page, DOE Form 4650.2 - Complete the form identified as Appendix E in this solicitation. No other cover page is permitted.

b. Scope of Work - Complete a Scope of Work which will be Page No. 2 of your application. A detailed format and example (related to a different research area) is provided as Appendix F. The Scope of Work page must not contain proprietary information.

2.5.2 Primary Content - TECHNICAL PROPOSAL INFORMATION

a. **Scientific and Technical Merit**

1. T**echnical Concept**

(Begin on page 3 of your application.) Define the specific technical problem addressed by your application and its importance. State the specific objectives of the proposed project, including questions it will try to answer to determine feasibility and soundness of the concept; discuss value added to DOE programs; identify and discuss major issues related to the investigation and key risk areas; and address innovation/uniqueness of the concept.

2. **Work Plan**

Indicate the overall background and technical approach to the problem and the part that the research plays in providing needed results. Discuss the feasibility of the approach to resolve major issues, the innovativeness of the proposed approach, and the advantages of the proposed approach compared to alternatives. Submit a work breakdown structure, performance and cost schedules, including decision points, intermediate and major milestones and delivery of hardware/software; the extent to

which the deliverables demonstrate advancement of the state-of-the-art of the technologies to commercial viability; and application readiness of the deliverables. State the anticipated results of the approach, with special emphasis on commercial potential, if the project is successful. This should address the technical, economic, or other benefits to the nation. Identify any specific groups in the commercial sector, the Federal Government, or other individuals that might be expected to use the projected results.

The work plan should provide an explicit, detailed description of the research approach and work to be performed. The plan should indicate what will be done, where it will be done, and how the work will be carried out. Specifically, indicate the amount and type of work to be performed by the applicant and subcontractors proposed.

The work plan should be linked with the objectives and the questions that the effort is designed to answer. This includes hardware demonstration and deliverables at the appropriate scale. The methods planned to achieve each objective or task should be discussed explicitly and in detail.

The performance and cost schedules must summarize technical objectives and work plan by very briefly stating the principal project objective(s), identifying the tasks to be performed, and listing the performance and cost schedules. The cost schedule shall be itemized by major task. The reporting requirements contained in this SFAA should also be identified and included in the performance schedule. (**Performance and Cost Schedules do not count toward the 25 page limitation.)**

b. **Company Qualifications**

1. **Experience**

Describe current significant research, and previous R&D projects, of similar size, scope, and complexity that are directly related to the application, including any conducted by the applicant organization or subcontractors. Discuss the objectives of the research conducted or underway and the results achieved. Describe how it relates to the effort proposed and any planned coordination with outside sources.

2. **Domestic Work Effort**

Identify the percentage of the proposed work effort which will be conducted in the United States (greater than 90% is desired), including subcontractor and consultant effort.

3. **Facilities**

Describe available instrumentation and physical facilities necessary to carry out the effort, including those of subcontractors proposed. Items of equipment to be purchased or leased (as detailed in Appendix O) must be justified under this section. If the equipment, instrumentation, and facilities are not the property of the applicant and are not to be purchased or leased, the source must be identified and their availability specifically confirmed in this section. A principal of the organization, such as a university, that owns or operates the facilities/equipment must certify regarding the availability and cost of facilities/equipment and any associated technician cost. A copy of this certification must be submitted as part of the application. **(Certification will not be counted in the 25 page limitation.**)

c. **Personnel Qualifications**

Technical and Business Skills

Identify the Principal Investigator and other key personnel involved, including major subcontractors (those that provide at least 25% of the effort proposed), and provide a description of their directly related education, professional training, and technical and business-related skills and work experience on projects of similar size, scope, and complexity. When vitae are extensive, summaries that focus on the most relevant experience or publications are desired. It is important that the requirements described in Section 1.9 concerning the Principal Investigator be met explicitly. **(Resumes submitted under this Section do not count toward the 25 page limitation**.) Also describe the time commitment of the Principal Investigator and other key personnel, including major subcontractors, on the proposed project. If consultants or subcontractors are to be used and are identified, this section must contain a specific statement that they have agreed to serve in the manner and to the extent described in the financial assistance application. A statement signed by the consultant should certify his/her availability and salary and must be submitted as part of the application. **(Signed statements required from consultants do not count towards the 25 page limitation**.)

2.5.3 BUSINESS MANAGEMENT CAPABILITIES - (The Business Management Capability information submitted in 2.5.3 does not count toward the 25 page limitation.)

a. **Financial Management System**

The applicant and each major subcontractor (those subcontractors providing at least 25% of the effort proposed) shall provide a description of the financial management system that will be utilized by addressing how the proposed system will satisfy the requirements of 10 CFR 600.121, Standards For Financial Management.

b. **Corporate Commitment**

Provide the name of the top corporate official of the applicant and each major subcontractor (those providing at least 25% of the effort) who will be responsible for this effort. Describe the commitment, availability to the project, and assistance they will provide in any specialty areas required to solve specific problems.

2.5.4 COST PROPOSAL INFORMATION - (The cost information submitted in 2.5.4 does not count toward the 25 page limitation.)

a. Complete the Budget Page, DOE F 4620.1, provided as Appendix N. If the application is for a multi-year period, use a separate budget page for each year. Also, submit a summary budget page covering the entire project period on a separate budget page.

b. On a separate page, provide a cost breakdown of the proposed budget by major tasks and a month by month spending plan for the duration of the project.

c. The information requested in Appendix O, Budget Explanation Page, is to be submitted with the summary budget page for support and justification of the project.

d. Appendix P, Model Indirect Cost Rate Proposal, is to be submitted when the applicant does not have indirect cost rates approved by a federal agency. If indirect rates have been negotiated with or approved by any other federal agency for the period covered, provide a copy of the agreement and do not submit the data required in Appendix P. If no current rate agreement exists, submit an indirect rate proposal based on the model provided in Appendix P. In either case, identify separately the proposed indirect costs for each of your accounting periods included in the proposal. Identify each rate and allocation base for indirect costs such as Overhead, General and Administrative, Facilities Capital Cost of Money, etc. This also applies to major subcontractors.

e. List and explain cost share arrangements.

f. Use Section G.5., Subcontracts, of Appendix N, to identify subcontractors' costs. A separate Budget Page and Budget Explanation are to be provided for each subcontractor and consultant.

g. Equipment budgets may be included, however equipment will be carefully reviewed relative to the need and appropriateness for the proposed research or R&D. Title to equipment acquired by a recipient with federal funds shall vest in the recipient, subject to conditions of 10 CFR 600.134., Equipment, of the DOE Financial Assistance Rules. Applicants should be aware that DOE anticipates exercising its right at the end of the project to take title to property purchased with project funds in accordance with 10 CFR 600.134(h) of its rules.

h. The applicant and each major subcontractor (those that will provide at least 25% of the effort) shall submit their latest certified annual report, Form 10K, financial statements and any other evidence of their financial status sufficient to demonstrate their capability to carry out the proposed work, including sources for cost sharing funds. Also, state what approximate percentage this proposed work will represent of the applicant's or subcontractor's total business during the period of performance.

2.5.5 Certifications - (*The information required under 2.5.5 will not be counted toward the application limitation of 25 pages*.) The following items are to be completed by the applicant and submitted with the application.

a. **Assurance of Compliance**, DOE F 1600.5;

b. **Certifications Regarding Lobbying; Debarment, Suspension and Other Responsibility Matters; and Drug-Free Workplace Requirements**, FA-CERTS;

c. **Disclosure of Lobbying Activities;**

d. **Financial Assistance Pre-Award Information Sheet,** AA-47;

e. **ACH Vendor/Miscellaneous Payment Enrollment Form;**

f. **EPAct Representation;**

g. **NEPA Environmental Evaluation Notification;** and

h. **Simpson-Craig Amendment Representation**

i. **Similar Financial Assistance Applications, Proposals or Awards** - While it is permissible, with notification in the financial assistance applications, to submit identical proposals or proposals containing a significant amount of essentially equivalent work for consideration under numerous federal program solicitations, it is unlawful to enter into a financial assistance award requiring essentially equivalent effort. If there is any question concerning this, it must be disclosed to the soliciting agency or agencies before award. If such a proposal has been previously funded or is either funded, pending, or about to be submitted to another federal agency or to the DOE in a separate action, the applicant must provide the following information in the application:

1. The name and address of the agency(s) to which a proposal or financial assistance application was submitted, or will be submitted, or from which an award is expected or has been received;

2. The date of submission or the date of award;

3. The title of the application;

4. The name and title of the project manager or Principal Investigator for each proposal or application submitted or award received;

5. The number and date of the solicitation under which the application or award was received.

6. If an award is made pursuant to an application submitted under this solicitation, the applicant will be required to certify that neither the applicant nor any of its employees have previously been or are currently being paid for essentially equivalent work by any agency of the Federal Government.

j. **Checklist.**

3. METHOD OF SELECTION AND EVALUATION CRITERIA

3.1 INTRODUCTION

Applicants will be evaluated in accordance with the evaluation criteria set forth below in Section 3.2. All applications will be screened initially by DOE to ensure that they meet the qualification criteria in Section 1.2 and the eligibility criteria in 1.3. Applications will be eliminated from consideration if an application is so obviously deficient as to be totally unacceptable on its face.

3.2 EVALUATION CRITERIA

3.2.1 General Conditions

DOE plans to select for award those applications judged to provide the overall greatest value to the Government within the estimated available funding.

Using the consensus method, the technical, business management, and cost proposal information submitted by the applicant will be evaluated. Applications will undergo a comprehensive technical evaluation in accordance with the criteria listed below. The technical proposal will be numerically point-scored. All work proposed for the total project period will be evaluated in accordance with those criteria. The business management proposal information will be evaluated and adjectivally rated. The cost proposal information submitted by the applicant will not be point scored or adjectivally rated, but will be evaluated to determine if the total proposed amount is commensurate with the effort proposed. Also the cost proposal will be evaluated to ascertain that the applicant has met the cost sharing requirements of the solicitation.

The Technical criteria are **significantly more important** than business management capability or cost; however, cost may be a determining factor in making the awards. The Source Selection Official (SSO) will also consider the Program Policy Factors identified in 3.3 below.

In preparing assistance applications, applicants should present sufficient evidence to ensure that each criterion is well addressed. Technical reviewers will base their evaluations only on information contained in the application and cannot consider their familiarity (if any) with the firm, its subcontractors (if any) or key individuals.

3.2.2 Technical Evaluation Criteria

Criterion a is the most important and is of slightly greater value than Criteria b and c combined. Criteria b and c are of equal value. With regard to the subcriteria: Under Criterion a, subcriteria 1 and 2 are of equal value; Under Criterion b, subcriteria 2 and 3 are of equal value, and combined are of equal value to subcriteria 1.

a. **Scientific and Technical Merit**

1. **Technical Concept**

The overall relevance of the technical problem identified; the feasibility of the proposed technical concept and soundness of the R&D program to meet the technical objectives of the solicitation; the value added to the DOE programs for successful completion of the proposed work; the identification and discussion of the major issues related to the investigation and the key risk areas of the application; and the degree to which the application is innovative and unique will be evaluated.

2. **Work Plan**

The soundness and likelihood of success of the proposed approach and its degree of innovation; the feasibility of the approach to resolve the major issues; the advantages of the proposed approach compared to alternatives; the intent and commitment to commercialize results of the proposed work; the adequacy and reasonableness of the work breakdown structure and performance and cost schedules, including decision points; the adequacy of the intermediate and major milestones and the delivery hardware/software; the extent to which the deliverables demonstrate advancement of the state-of-the art of these technologies to commercial viability; the extent to which the deliverables are application (i.e., automotive, building, etc.) ready; compact, durable, cost effective, and amenable to mass production; and the extent to which the proposal details the delivery of relevant, important test data at intermediate milestones and project end to meet the project requirements will be evaluated.

b. **Company Qualifications**

1. **Experience**

The applicant's current significant research, and experience on previous R&D projects, (including applicant organization and subcontractors proposed), on projects similar in size, scope and complexity directly related to the topic proposed, and the success in completing similar work will be evaluated.

2. **Domestic Work Effort**

The percentage of the proposed work effort which will be conducted in the United States, including subcontractor and consultant effort, (greater than 90 percent desired), will be evaluated.

3. **Facilities**

The adequacy of the applicant's proposed facilities, and those of subcontractors proposed, the commitment to use those facilities for the proposed program, and the reasonableness of any request for new facilities and equipment will be evaluated.

c. **Personnel Qualifications**

Technical and Business Skills

The education, professional training, and the technical and business-related skills and work experience of the principal investigator and other key personnel, including major subcontractors (those that will provide at least 25% of the

effort proposed), on projects similar in size, scope, and complexity to the topic proposed will be evaluated. The level and reasonableness of the time commitment of the principal investigator and other key personnel, including major subcontractors, assigned to the proposed program will be evaluated.

3.2.3 Business Management Evaluation Criteria

The Business Management capability information submitted with the application will be evaluated but not point scored. An overall adjectival rating will be determined based on the evaluation of the criteria set forth below. Criteria a and b are of equal importance.

a. **Financial Management System**

The financial management system of the applicant and each major subcontractor (those subcontractors providing at least 25% of the effort proposed) will be evaluated to determine if the system(s) satisfy the requirements of 10 CFR 600.121, Standards For Financial Management.

b. **Corporate Commitment**

The interest of corporate management and the priority the company will place on the proposed work and the assistance they will provide in any specialty area required to solve specific problems. If the applicant proposes teaming arrangements the overall commitment of the team will be evaluated collectively.

3.2.4 Cost Evaluation Criteria

The proposed cost will not be point scored or adjectivally rated, however, it will be evaluated to determine if the total proposed amount is commensurate with the effort proposed.

Also, the proposed cost will be evaluated to ascertain that the applicant has met the cost sharing requirements specified in the solicitation. **Those applications not meeting the minimum cost sharing requirements specified in the appendices of this solicitation will be eliminated from further consideration in an initial evaluation and will not be technically evaluated**.

3.3 PROGRAM POLICY FACTORS

Program Policy Factors, while not appropriate indicators of an application's individual technical merit, are relevant and essential to the process of choosing which of the applications received will best achieve the Department's overall programmatic goals. Upon completion of the technical, business and cost evaluations, those applications which are potential candidates for award will be reviewed and further evaluated based upon the actual funding appropriated and the following program policy factors:

a. Selection of applications to achieve a balance of complimentary projects within Topic areas.

b. Selection of applications which best compliment or enhance existing DOE programs in the Office of Transportation Technologies (OTT), the Office of Building Equipment (OBE), and the DOE hydrogen program within the Office of Utility Technologies (OUT).

c. Selection of projects which will have the greatest potential to foster U.S. competitiveness.

d. Selection of projects involving teams which represent a diversity (types and sizes) of proposing organizations.

3.4 DEBRIEFING

If a written request for a debriefing is received by Mr. John O'Keefe, Executive Secretary for the solicitation, within 10 days after the announcement of the final selections, a verbal debriefing will be provided with information pertinent to DOE's evaluation of the application. Neither the identity of the reviewers nor their verbatim comments will be disclosed. Debriefings will be scheduled at a time mutually convenient to DOE and the applicant.

4. CONSIDERATIONS

4.1 RIGHT TO REQUEST PATENT WAIVER

Offerors and prospective applicants, in accordance with applicable statutes and the Department of Energy Acquisition Regulations (DEAR), have the right to request, in advance of or within 30 days after the effective date of award, a waiver of all or any part of the rights of the United States in subject inventions. Small business firms and domestic nonprofit organizations normally will receive the Patent Rights clause of DEAR 952.227-71 which permits the recipient to retain title to subject inventions, except in contracts for management or operation of a Government-owned research or production facility and in contracts involving exceptional circumstances or intelligence activities. Therefore, small business firms and non-profit organizations normally need not request a waiver.

4.2 ADVANCE WAIVER OF PATENT RIGHTS

The terms of an advance waiver of patent rights are at FAR 52.227-12, as supplemented by 10 CFR 784, DOE patent waiver regulations, and are subject to such mutually acceptable modifications as may be appropriate considering the nature of the technology, the U.S. manufacturing base, and the relevant markets.

4.3 RESTRICTION ON TRANSFER OF FUEL CELL TECHNOLOGY TO FOREIGN ENTITIES

It is agreed that the Participant shall obtain adequate recognition of the United States support for the technology developed under this Program in any contracts, assistance, licenses, or other agreements which involve the transfer to foreign entities of the fuel cell technology developed in whole or in part at Government expense. The Participant agrees to notify DOE, as represented by DOE Patent Counsel, in writing, of the adequate recognition obtained prior to entering into any such contracts, assistance, licenses, or other agreements. The Participant shall not enter into any such contracts, assistance, licenses, or other agreements without the concurrence of DOE, as represented by DOE Patent Counsel. The determination of whether to grant such concurrence shall be at the sole discretion of DOE and is not subject to the Disputes or Appeals (at 10 CFR 600.22) or otherwise subject to litigation under the Contract Disputes Act of 1978 (41 U.S.C. 601 et seq.). The determination shall be in writing and shall be furnished to the Participant by the Contracting Officer. Examples of such an adequate recognition could include: (1) a commitment to manufacture in the U.S.A.; (2) a requirement to reimburse the U.S. Government for its R&D costs; and/or (3) a commitment to jointly sponsor the R&D program.

4.4 ADDITIONAL INFORMATION

A. This solicitation is intended for informational purposes and reflects current DOE objectives. If there is any inconsistency between the information contained herein and the terms of any resulting assistance award, the terms of the award shall prevail.

B. Before issuing an award, DOE may request the applicant to provide certain organizational, management, personnel, and financial information to assure responsibility of the applicant. In addition, the selected applicant(s) may be required to submit environmental information. Award will not be made until all DOE environmental requirements are completed. DOE reserves the right to request from an awardee additional environmental information upon any proposed redirection of the work and to use that information in making a determination concerning redirection.

C. The point of contact for correspondence or questions concerning this solicitation is John O'Keefe at the mailing address cited in Section 5.1 or by Internet address: "john.o'keefe@ch.doe.gov".

5. SUBMISSION OF PREAPPLICATIONS AND APPLICATIONS

5.1 MAILING ADDRESS

Electronic submission (telegraph, facsimile, or Internet) of preapplications or applications is not authorized. Preapplications and applications shall be submitted in writing to:

John K. O'Keefe, Executive Secretary
Solicitation No. DE-SC02-98EE50526
Closing Date and Time: _____
U.S. Department of Energy
Chicago Operations Office
9800 South Cass Avenue, Building 201, Room 3D-06
Argonne, IL 60439-4899

External markings for preapplications and applications shall cite the above mailing address and the closing date and time.

5.2 DUE DATE FOR PREAPPLICATIONS

The deadline for receipt of preapplications is on or before **3:00 p.m. Local Time, August 27, 1998.**

5.3 DUE DATE FOR APPLICATIONS

The deadline for receipt of applications is on or before **3:00 p.m. Local time, October 7, 1998.**

5.4 LATE PREAPPLICATIONS AND APPLICATIONS

Any preapplication or application received after the above-specified due dates and times will not be evaluated. Failure to submit a preapplication does not preclude anyone from submitting a full application.

5.5 HANDCARRIED PREAPPLICATIONS AND APPLICATIONS

If the applicant elects to forward the preapplication/application by means other than the U.S. Mail (including United Parcel Service, Federal Express, or other means of delivery), it assumes the full responsibility of ensuring that the preapplication/application is received by John O'Keefe, Executive Secretary of this solicitation, at the exact location and by the date and time specified in Sections 5.2 and 5.3. Preapplications/applications handcarried by the applicant shall be delivered only to John O'Keefe at the address specified in Section 5.1.

NOTE: The U. S. Department of Energy, Chicago Operations Office, is located on the site of Argonne National Laboratory (ANL), and preapplications or applications must be delivered only to John O'Keefe at the room specified in Section 5.1. Delivery to and/or acceptance by ANL, including delivery to and/or acceptance by the ANL Visitor's Reception Center, ANL loading docks, or to any other ANL receiving point DOES NOT CONSTITUTE DELIVERY OF YOUR APPLICATION IN ACCORDANCE WITH THE TERMS OF THIS SOLICITATION. **ANL is a controlled access facility, which may require advance clearance arrangements, particularly for non-U.S. citizens. Sufficient time should be allotted for normal admittance procedures which may be coordinated with John O'Keefe at 630/252-2125.**

STATEMENT OF OBJECTIVES

RESEARCH AND DEVELOPMENT FOR FUEL CELLS, DIRECT INJECTION ENGINES, AND FUELS: ENERGY EFFICIENCY AND RENEWABLE ENERGY TECHNOLOGY FOR TRANSPORTATION AND BUILDINGS

Fuel Cells for Transportation and Buildings

The United States Department of Energy (DOE) is sponsoring research on fuel cell technology for transportation and for building applications. This solicitation seeks innovative research and development in several subtopic areas (identified by lowercase letters); offerors must clearly identify the topic and subtopic area in the proposal.

The transportation technology developments being sought under this solicitation support the Partnership for a New Generation of Vehicles (PNGV) and the implementation of the Office of Advanced Automotive Technologies (OAAT) R&D Plan. The aim of PNGV is to develop technologies for a new generation of vehicles that could achieve fuel economies up to three times those of comparable 1994 family sedans. The OAAT R&D Plan fully supports PNGV in the areas of fuel cells, direct injection engines, and fuels. The Fuel Cell for Buildings Program is developing those key PEM fuel cell power system technologies specific to building applications.

Cost sharing requirements vary within the topic area and are detailed below. All dollars are total dollars and include cost share.

Topic 1. Fuel Cells for Transportation and Buildings – The goal of the program is to develop proton-exchange-membrane (PEM) fuel cell systems as alternative power sources to internal combustion engines (ICEs) and to grid-based electricity in buildings.

Fuel Cells for Transportation - Fuel cell technology has been selected as one of the most promising candidates for achieving the goal of 80-mpg fuel economy in a six-passenger sedan. In addition to greatly improved fuel economy, these vehicles are expected to meet future emissions standards and offer the same level of performance and cost as todays vehicles. The automotive market presents the greatest opportunity for fuel savings and reduced environmental emissions. However, many technical barriers remain. In October 1997, a fuel cell/reformer system fueled by gasoline generated electricity for the first time in a PEM fuel cell. Also in October 1997, DOE awarded major cooperative agreements for integrated systems and for components such as fuel processors and bipolar plates. This solicitation addresses many of the technical barriers that have been identified in recent National Research Council Peer Reviews. This demonstration exemplified the recent technological progress of fuel

cells and enhanced their prospects for success. However, fuel cell technology must progress beyond its current state-of-the-art before it can be considered a viable alternative to the internal combustion engine. The required advances are in the areas of systems integration, component development, and fuel processing. The technical challenges that must be addressed before transportation applications can be successful are size and weight reduction , manufacturing cost reduction, start-up and operational uncertainties, durability and reliability, and fuel storage, conditioning, and delivery.

Systems Integration - This solicitation seeks to more thoroughly assess the capabilities and limitations of fuel cell power systems for transportation applications and to expand R&D in key areas. The system designs/deliverables are expected to demonstrate the ability to meet technical and cost targets when projected to the 50-kW size. The cost target for the integrated system makes allowance for integration of the fuel cell stack, fuel processor, and other components. Offerors are expected to discuss the potential for competitive cost and performance of their proposed system and must describe how its successful demonstration will advance fuel cell technology for transportation. Specifically, this topic concerns the investigation of the following system-level issues:

(a) Development and fabrication of an integrated state-of-the-art (SOA) 10-kW or larger (but no larger than 50 kW) fuel cell system for use in establishing baseline start-up, transient response, and extreme temperature performance/operational characteristics. The system will be delivered to Argonne National Laboratory (ANL). Candidate fuel cell power systems should be capable of operating on methanol, ethanol, natural gas, and gasoline and incorporate diagnostic sensors (temperature, pressure, and voltage) for computer-based monitoring and data acquisition by an independent fuel cell test laboratory. The type, quantity, and location of these sensors should allow the test laboratory to identify the sources of operational and performance limitations during start-up and power transients, as well as at the temperature extremes. Detailed information on the sensors should be provided in the response to this solicitation. Data collected and analyzed in these characterization tests will be used to validate and refine the fuel cell system model developed by ANL. It is anticipated that the total award(s) will be about $2.5 million, including minimum required contractor cost share of 20 percent. Delivery of the system to ANL is expected in 6 -9 months. The proposal should provide supporting services for a two year period.

(b) Development and testing of a 10-kW system to validate concepts for managing water balance and freeze-thaw issues encountered in the operating and stand-by modes of fuel cell power systems at the ambient temperature extremes associated with automotive applications. The system should include a fuel processor and be capable of operating on

methanol, ethanol, natural gas, and gasoline. The automotive operating temperature extremes are -40 °C and +52°C, while the survival temperature extremes are -46 °C and +66°C. The results and recommendations from these studies will be documented and supplied to DOE. It is anticipated that the total award(s) will be about $2.7 million, including minimum required contractor cost share of 25 percent over two years.

(c) Cost analyses based on representative fuel cell systems using industry-standard engineering design for manufacture and assembly (DFMA) techniques. This project is intended to include both ambient and pressurized designs. The selected designs should be able to meet the performance targets shown in Tables 1a - d. Manufacturing processes must be developed and detailed to the extent necessary to produce credible estimates of equipment, materials, and manufacturing costs. It is intended that this analysis be updated annually for four years to reflect the continuing development and evolution of fuel cell systems. The deliverable is a detailed design report and cost analysis. It is anticipated that the total award will be about $0.8 million, including minimum required contractor cost share of 20 percent.

Fuel Cell Components - Successful development of low-cost, high-performance components that are qualified for automotive duty is critical if overall system cost and performance goals are to be achieved. Offerors are expected to discuss the potential for competitive cost and performance of their proposed component(s) or subsystem. Offerors must demonstrate through hardware testing that they could meet the DOE technical and cost targets when they are integrated into a complete power system. Where appropriate, hardware testing should be done at actual scale in collaboration with fuel cell stack developers or the national laboratories. At the conclusion of the development effort, the component hardware shall be delivered to ANL. This solicitation seeks innovative research and development of components for fuel cell systems that addresses the following priorities:

(d) Membrane electrode assemblies (MEAs). Development of lower-cost MEAs with higher activity cathodes and increased CO tolerance (anode) which, when combined with advanced bipolar plates, yields a higher cell operating voltage to meet the stack efficiency targets in Table 1b. Proposals in this topic area may

(1) evaluate alternative catalyst formulations (e.g., binary and ternary alloys, non-precious metal catalysts) to improve the CO tolerance of fuel cells (Table 1b);

(2) develop polymer membranes having higher ionic conductance, improved humidification properties, or lower gas permeability than state-of-the-art membranes; and/or
(3) develop pilot manufacturing processes for high-volume production that can meet the PNGV cost target for MEAs of $10/kW.

Proposals that address more than one of the subtopics are preferred. Deliverables in this topic area are enough finished pieces for a 1-10 kW stack to verify performance predictions; the proposer should collaborate with a fuel cell stack developer to demonstrate their technology in a small stack which will be delivered to Argonne National Laboratory (ANL). It is anticipated that the total award(s) for (d-1) and (d-2) will be about $3 million, including required contractor cost share of 25 percent over 18 months. It is anticipated that the total award(s) for item (d-3) will be about $9 million, including required contractor cost share of 35 percent over two years.

(e) Compression/expansion technology. Development, characterization testing, and delivery of one or more compact, efficient, and low-cost air management systems for pressurized PEM fuel cell operation in a 50-kW system. Candidate air systems should incorporate an integrated compressor/expander/motor, packaged for automotive use, and be capable of maintaining pressure ratio on a 10:1 turndown. Technical targets are shown in Table 1d. Deliverables to ANL are expected in 18 months. It is anticipated that the total award(s) will be about $1.5 million, including required contractor cost share of 50 percent over two years.

(f) Advanced stack sealant technology. Development and evaluation of advanced stack sealant materials (seals, gaskets, adhesives, for example) to enhance stack integrity, durability, and manufacturability. These materials should be compatible with other stack materials and stable to the chemical, electrochemical, and thermal environment of PEM fuel cell stacks, when employed in fuel cell power systems for automotive applications. Developers should identify a PEM fuel cell stack manufacturer who will conduct in-stack evaluations of the most promising materials. The results of this development and testing will be documented and supplied to DOE. It is anticipated that the total award(s) will be about $2 million, including required contractor cost share of 25 percent over two years.

(g) Sensors and detectors. Development of devices to identify and measure chemical species (such as CO, H_2, H_2S, and hydrocarbons) and to identify operating conditions (such as mass flow rates, humidity, temperature, and pressure) in a reliable manner. These devices must function adequately in an automotive environment and perform reliably for the life of the

vehicle (>5,000 operating hours). They must have the potential to be produced in high volume at low cost. Sensors must have an electrical output capable of driving a control system and response rates compatible with their intended functions. Detectors indicate the presence or absence of a condition (for example, high or low concentration, temperature, or pressure) and are not intended to drive a control system. Sensors (1-6) and detectors (7-8) for the following priority needs are sought:

(1) Low-concentration carbon-monoxide sensor, for measuring CO concentrations as low as 10 ppm or as high as 200 ppm in the gas mixture entering the fuel cell stack. The CO sensor is expected to require a response time of approximately 0.2 seconds.
(2) Carbon monoxide sensor (0.1-20%) with a response time of 0.2 seconds.
(3) High-concentration hydrogen sensors (1-100%) ; the H_2 sensor is expected to provide a response time of at least 0.2-2 seconds.
(4) Sensors for measuring gas temperatures over the range 20-1200°C, with fast response.
(5) Coolant conductivity meter capable of measuring to <10 micromho.
(6) Differential hydrogen concentration sensor [i.e., H_2(in) - H_2(out)].
(7) Reactive hydrocarbon detector (0-5000 ppm).
(8) Reactive sulfur (H_2S) detector (0-100 ppm).

The anticipated funding available for this activity has intentionally not been specified; funding and duration depend on project scope. The required cost share is 25 percent. Proposals that address more than one of the above required sensors/detectors are preferred.

(h) Fuel cell stack durability. Demonstration of the durability of stack components over automotive duty cycles by long-duration testing (5000 hours). Establish bench marks for the durability of PEM stacks that incorporate advanced component and design concepts. Testing is expected to be conducted using actual or synthetic reformate (approximate dry composition: H_2, 40%; CO_2, 21%; N_2, 39%; CO, 10-50 ppm) as the fuel. The PEM stack(s) designated for durability testing should be of advanced design and performance, contain a minimum of 10 cells (1 to 2 kW output at full power), and have a full-scale active area (>200 cm^2). Offerors should (1) adequately discuss the relative importance of operating factors known or expected to influence the long-term durability of PEM stacks in vehicle applications (e.g., frequency/number of stack startups/ shutdowns, extended operation at full- and part-load, transient operation over standard duty cycles, freeze/thaw cycles, and air impurities) and (2) identify which durability-related operating factors the applicant intends to include in the development of the test plan. Offerors must identify the performance

parameters which will be evaluated during testing. At the conclusion of testing, the stack shall be delivered to ANL for performance verification, and then it will be returned to the offeror for post-test examination. It is anticipated that the total award(s) will be about $2 million, including required contractor cost share of 50 percent over two years.

(i) Coolants. Development and testing of coolants that are compatible with fuel cells. Coolants for fuel cells must be non-conductive (<10 micromho), noncorrosive when in contact with the fuel cell internals and system heat exchangers, stable over the conditions of operation and ambient temperature specifications in Topic 1-b (-46 °C to 66°C). It is anticipated that the total award(s) will be about $1 million, including required contractor cost share of 25 percent over 18 months.

Fuel Processing - Performance targets for the fuel processor have been established (see Table 1c) for operation on California Phase II Reformulated Gasoline; fuel processor performance for the other fuels is expected to exceed the target values for gasoline. The highest priority fuel processing issues are the presence of CO in the reformate and sulfur in the fuel which degrade system performance. Offerors are expected to discuss the potential for competitive cost and performance of their proposed fuel processing component(s) or subsystem. Offerors must demonstrate through hardware testing that they can meet the DOE technical and cost targets in Table 1c when they are integrated into a complete power system. Hardware testing should be done at an appropriate scale, up to 50-kW equivalent output. At the conclusion of the development effort, the resultant hardware shall be delivered to ANL. Proposals are sought in the following areas:

(j) Advanced fuel processors, water-gas shift catalysts, and CO clean-up technologies. Offerors must demonstrate the potential for superior performance and control during transient operation, reduced H_2 consumption, and lower cost, weight, and volume. Proposals offering a complete system that addresses subtopics (j -1) through (j -3) are preferred. It is anticipated that the total award(s) will be about $6 million, including required contractor cost share of 35 percent over 30 months.

(1) Development of advanced fuel processing systems, capable of meeting 2004 targets, having improved startup and transient response. Proposals may include the application of microfabrication or other novel technologies to reduce the size, weight, and cost of heat exchangers, vaporizers, and/or process reactors.
(2) Proposals are also sought for the development and evaluation of novel water-gas shift catalysts that represent a significant improvement over current state-of-the-art shift catalysts for

reducing the CO level leaving the shift reactor. These advanced catalysts should exhibit higher activity to reduce the weight, volume, and cost of the shift reactor, and demonstrate increased thermal and environmental stability for extended catalyst lifetime. The high-temperature shift catalyst should be able to reduce the CO in the reformate from 200,000 ppm to 20,000 ppm or less. The performance target for the low-temperature shift catalyst is a reduction in the reformate CO level from 20,000 to 2,000 ppm or less. The durability target for the catalysts is 5,000 hours.

(3) Proposals are also sought for the development of innovative techniques (such as advanced preferential oxidizers and CO sorption techniques) that are capable of reducing the CO level in the reformate to <10 ppm with low hydrogen consumption. Proposals for removing sulfur from the fuel prior to the reformer are also sought.

(4) Design, fabrication, and delivery of a 10-kW partial oxidation or autothermal fuel reformer for testing the effects of gasoline or other transportation fuel formulations on reformer performance. The system must be capable of producing a minimum hydrogen concentration of 30 percent, reducing the outlet CO concentration to 10-50 ppm, and operating with at least 50 ppm sulfur in the fuel. Higher outlet hydrogen concentration is desired. The reformer should be easy to disassemble. Delivery to ANL is expected in six (6) months. It is anticipated that the total award(s) will be about $0.75 million, including minimum required contractor cost share of 20 percent.

(k) Design for high-volume manufacturing of preferential oxidation (PROX) hardware based on technology developed by Los Alamos National Laboratory (LANL). Catalytic treatment in PROX devices is required to control contaminants (primarily CO) in the effluent from on-board fuel reformers used as the fuel feed stream to PEM fuel cell systems. Improved PROX units are sought that meet the specifications for performance, size and cost in Table 1e. This activity will consist of three phases, over a two to three year time period:

Phase 1: Design Optimization: Identify best design choices for future PROX components in collaboration with LANL. Experience in design and manufacture of catalytic systems; in design of cost effective, rugged sensors; and in design of electronic control systems is necessary.

Phase 2: Manufacturing Engineering: Develop designs for manufacturing, incorporating appropriate chemical engineering design

approaches, for hardware with required market-driven specifications. Modern manufacturing technology experience is required.

Phase 3: Prototype Testing: Build multiple copies of one or more designs resulting from the first two phases using small-scale, but scaleable, manufacturing capability. These manufacturing prototype units will be thoroughly tested by LANL at several different sites over a range of operating scenarios. Required design modifications will be made, as needed, and those improvements tested as well.

Participation in more than one phase is acceptable and encouraged. Technical excellence in catalytic reactor engineering; in development of small-scale sensors for carbon monoxide, or other species of interest; and in rugged, miniaturized electronic control hardware is necessary. More than one award may be made for this activity. It is anticipated that the total award(s) for this activity will be approximately $8 million, including minimum required contractor cost share of 35 percent over 2-3 years. Funding for LANL collaboration in this activity will be separate from this solicitation and provided directly to LANL by DOE. Questions should not be directed to LANL, but to John O'Keefe, Executive Secretary of this solicitation. Questions and answers will be posted on the Internet.

(l) Fuel processor durability. Establish benchmarks, against the durability target (5000 hours), by testing complete fuel processing systems over automotive duty cycles and start/stop cycles. Proposals responsive to this topic area should: (1) adequately discuss the relative importance of operating factors known or expected to influence the long-term durability of fuel processing systems in vehicle applications (e.g. number and frequency of startups/shutdowns, extended operation at full- and part-load, transient operation over standard duty cycles, and thermal cycles), and (2) identify which durability-related operating factors the applicant intends to include in the development of the test plan. Proposed efforts should address a careful study of the stability/degradation of fuel processing catalysts, and/or the long-term testing and demonstration of a 10-kW (electrical equivalent) fuel processing system. Offerors should identify the performance parameters to be evaluated during testing. It is anticipated that the total award(s) will be about $2 million, including minimum required contractor cost share of 40 percent over 24 months.

Fuel Cells for Buildings – The Fuel Cells for Buildings Program is developing those key PEM fuel cell power system components and subsystems specific to building cogeneration applications that are consistent with:

- heat rejection temperatures in excess of 100 ^{o}C to provide access to a broad range of applications for cogeneration systems and reduce the cost of heat rejection when operating in a power only mode,
- operation on natural gas,
- a system level (includes fuel processor, fuel cell, power electronics, and air and thermal management) thermal-to-electrical energy efficiency at full power of 35% or higher based on the higher heating value (HHV) of the fuel,
- operation at a pressure of 1.5 atm or below,
- simple construction with no heavily loaded mechanical subsystems that limit life and reliability,
- high reliability during long-term operation (>40,000 hrs) on natural gas reformate from low-cost fuel processors, and
- a manufacturing cost structure that achieves an overall installed system cost target of $1,500/kW or lower.

The initial emphasis of the Fuel Cell for Buildings Program is on commercial buildings with electrical requirements in the range of 50 kW to 300 kW due to a combination of their favorable load characteristics, high electric rate structures, the economies of scale associated with equipment implementation, and consistency with the power range being developed for transportation applications. Successful development of the technology for commercial buildings will provide a basis for addressing the large residential market potential.

The current Fuel Cell for Buildings Program is focused on the development of a natural gas fuel processor. This work will result in an early breadboard natural gas fuel processor(s) ready for integration with a PEM fuel cell stack system. For cost effectiveness, these early system demonstrations will utilize existing PEM fuel cell stack technology developed under the Fuel Cells for Transportation Program. These stacks, designed to operate at high efficiency under part load conditions, need to be optimized to operate at high efficiency at full load and with greater durability for cogeneration building applications.

Building-Specific Fuel Cell Components and Systems – With this solicitation, the Fuel Cell for Buildings Program seeks to initiate innovative research that will lead to development of an advanced membrane material for high-temperature (100ºC or greater) fuel cell systems, and the design, assembly, and testing of an integrated PEM fuel cell power system for light commercial building cogeneration applications. Research in the following areas is sought:

(m) Development of a high-temperature membrane material with performance approaching or exceeding that of state-of-the-art membranes. Proposals are sought for the development of new fuel cell membrane materials with a maximum operating temperature in the range of 100°C to 140°C (upper end of range preferred), an operating pressure of less than 1.5 atm, an area specific resistance less than 20 Ohm•cm^2,

less than 0.1 percent cross-over of gases, and a life of 20,000 h. The development of such a membrane is expected to virtually eliminate the need for an unlubricated compressor and expander; reduce or eliminate CO poisoning as a major technical issue for prolonged catalyst life; and expand the markets for light commercial co-generation systems. Candidate membrane materials developed under this program should be assembled into MEAs and fully characterized in full-scale (>200 cm^2) single-cell and multi-cell stack tests. The MEAs should demonstrate the capability to achieve a target power density of 350 W/cm^2 at 0.7 V and greatly ease or eliminate the need for membrane water management. It is anticipated that the total award(s) will be about $2.0 million dollars, including required contractor cost share of 25 percent with project durations of 12 to 18 months.

(n) The design, fabrication and testing of an integrated PEM fuel cell system. Proposals are sought for the design, fabrication, and testing of an integrated PEM fuel cell system with a capacity of 50 kW that meets or exceeds the performance targets identified above for light commercial building applications. Projects responsive to this topic will be phased. Phase I will develop the system design consisting of the fuel processor, the PEM fuel cell stack, the air and thermal management systems, a power conditioning unit, and the necessary interface to make use of the waste heat for co-generation purposes. Phase II will consist of the fabrication/procurement, brassboard assembly, and testing of the system designed in Phase I. In Phase III, a prototype packaged system will be developed and assembled for field testing and evaluation. Only those Phase I participants selected through this FAS will be eligible to compete for the subsequent Phase II. The successful completion of Phase I will be a pre-requisite to a Phase II application. The work for Phases I and II, assuming that it progresses satisfactorily, should be adequate in nature for progression to Phase III. It is anticipated that the total funding available for Phase I of this effort will be about $1.0 million, including required contractor cost share of 25 percent and have a program duration of 8 to 12 months.

Table 1a. Technical targets: integrated fuel cell power systems
(including fuel processor, stack and auxiliaries;
excluding gasoline tank and DC-DC converter)

Characteristic[a]	Units	Calendar Year		
		1997	2000	2004
Energy efficiency[b] @ 25% of peak power	%	35	40	48
Power density	W/L	200	250	300
Specific power	W/kg	200	250	300
Cost[c]	$/kW	300	150	50
Startup to full power	min	2	1	0.5
Transient response (time from 10 to 90% power)	sec	30	20	10
Emissions[d]		<Tier 2	<Tier 2	<Tier 2
Durability[e]	hour	1000	2000	5000

[a] Targets pertain to gasoline fuel; all targets will be refined through Systems Analysis and Vehicle Engineering analyses (consistent with those of the PNGV).
[b] Ratio of dc output energy to the lower heati ng value of the input fuel (gasoline).
[c] Includes projected cost advantage of high volume production and includes cost for assembling/integrating the fuel cell system and fuel processor.
[d] Emission levels will comply with emission regulations projected to be in place when the technology is available for market introduction.
[e] Less than 5 percent power degradation in the time between catalyst replacement.

Table 1b. Technical targets[a]: fuel cell stack systems running on hydrogen-rich fuelfrom fuel-flexible fuel processor 50 kW peak power (continuous)[b]
(Excludes fuel processing/delivery system)
(Includes fuel cell ancillaries: i.e., heat, water, air management systems)

Characteristic	Unit	Calendar Year		
		1997	2000	2004
Stack system power density[b]	W/L	300	350	500
Stack system specific power	W/kg	300	350	500
Stack system efficiency[c] @ 25% of peak power	%	50	55	60
Stack system efficiency[c] @ peak power	%	40	44	48
Precious metal loading	g/peak kW	2.0	0.9	0.2
Cost[d]	$/kW	200	100	35
Durability (<5% power degradation)	hour	>1000	>2000	>5000
Transient performance (time from 10-90% power)	sec	10	3	1
Cold startup to maximum power -40°C	min	15	5	2
20°C		2	1	0.5
Emissions[e]		<Tier 2	<Tier 2	<Tier 2
CO tolerance (steady state)	ppm	10	100	1000
CO tolerance (transient)	ppm	100	500	5000

[a] Technical targets are consistent with those of the PNGV.
[b] Power refers to net power (i.e. stack power minus auxiliary power requirements).
[c] Ratio of output DC energy to lower heating value of hydrogen-rich fuel stream.
[d] High-volume production: 500,000 units per year.
[e] Emission levels will comply with emission regulations projected to be in place when the technology is available for market introduction.

Table 1c. Technical targets: fuel-flexible fuel processors[a]
(Excludes fuel storage, includes controls,
shift reactors, CO clean-up, heat exchangers)

Characteristics	Units	Calendar Year		
		1997	2000	2004
Energy efficiency[b]	%	70	75	80
Power density	W/L	400	600	750
Specific power	W/kg	400	600	750
Cost[c]	$/kW	50	30	10
Start-up to full power	min	2	1	0.5
Transient response (time from 10 to 90% power)	sec	30	20	10
Emissions[d]		<Tier 2	<Tier 2	<Tier 2
Durability[e]	Hours	1000	2000	5000
CO content steady state[f]	ppm	100	10	10
CO content transient[f]	ppm	5000	500	100
H_2S content in product stream	ppm	0	0	0
NH_3 content in product stream		<10	10	<10

[a] Targets pertain to gasoline fuel and are consistent with those of the PNGV.
[b] Fuel processor efficiency = total fuel cell system efficiency/fuel cell stack system efficiency, where total fuel cell system efficiency accounts for thermal integration.
[c] High-volume production: 500,000 units per year.
[d] Emission levels will comply with emission regulations projected to be in place when the technology is available for market introduction.
[e] Time between catalyst replacement.
[f] Dependent on stack development (CO tolerance) progress.

Table 1d. DOE targets for compressor/expander (50 kW fuel cell net)

Parameters	Compressor	Expander	Overall	Motor
Flow Rate @ Max Power Dry Air: (g/sec) (kg/hr)	 64 to 76 230 to 273	 56 to 70 203 to 254		
Water Vapor: (g/sec) (kg/hr)	0 to 4 0 to 11	9 to 16 31 to 55		
Stoichiometry	2.0	2.0		
Inlet Pressure (atm) (kPa) (psia)	1.0 101.3 14.7	2.8 283.6 41.2		
Outlet Pressure (atm) (kPa) (psia)	3.2 324.2 47.0	1.0 101.3 14.7		
Inlet Temperature Design Point: (^oC) (^oF)	 20 to 25 68 to 77	 118 to 150 244 to 302		 20 to 25 68 to 77
Extreme: (^oC) (^oF)	-40 to 60 -40 to 140	65 to 150 149 to 302		-40 to 60 -40 to 140
Max. Shaft Power (kW)	12.6	8.3	4.3	4.3 sustained 6 peak
Turndown Ratio	10:1	10:1		
Stages	1 or 2	1		1
Contamination	Oil-free <100 ppm particles			
Eff. vs Flow & Press Ratio 100% flow 3.2 PR 80% flow 3.2 PR 60% flow 2.7 PR 40% flow 2.1 PR 20% flow 1.6 PR (min.) 10% flow 1.3 PR (min.)	 75% 80% 75% 70% 65% 50%	 90% 90% 86% 82% 80% 75%	 68% 72% 65% 57% 52% 38%	 90% 90% 90% 90% 90% 90%
Volume[a]	4 liters total (w/o heat exchangers)			
Weight[a]	3 kg total (w/o heat exchangers)			
Production Unit Cost[a] @ 100,000 units/ yr	$200 total (w/o heat exchangers) [$30/lb]			
Start-up Response	<5 sec to 90% max. rpm			
Transient Response	<4 sec for 20 to 90% max. flow			
Noise	<80 db			

[a] These values do not include heat exchangers or motors/controllers, however sizing trade-off studies should target minimization of the overall air supply subsystem.

Table 1e. Target PROX specifications

Characteristic	Value
Output CO Concentration	<20 ppm based on an input reformate composition of 2% CO, 30-75% H_2, balance CO_2 and N_2
Transients	<20 ppm CO after 1 minute start-up; <20 ppm CO within 2 sec after + 90% electrical load transient
Hydrogen Consumption	<20% of CO removed
Device Volume	no more than 2.0 X catalyst volume
Device Cost	< $300 (sized for 50kW fuel cell system)
Device Pressure Drop	21 kPa (3 psi)
Particulates	Device must be tolerant of soot and debris

STATEMENT OF OBJECTIVES

RESEARCH AND DEVELOPMENT FOR FUEL CELLS, DIRECT INJECTION ENGINES, AND FUELS: ENERGY EFFICIENCY AND RENEWABLE ENERGY TECHNOLOGY FOR TRANSPORTATION AND BUILDINGS

Direct Injection Engines

The United States Department of Energy (DOE) is sponsoring research on direct injection engine technology for transportation applications. This solicitation seeks innovative research and development in several subtopic areas (identified by lowercase letters); offerors must clearly identify the topic and subtopic area in the proposal.

The transportation technology developments being sought under this solicitation support the Partnership for a New Generation of Vehicles (PNGV) and the implementation of the Office of Advanced Automotive Technologies (OAAT) R&D Plan. The aim of PNGV is to develop technologies for a new generation of vehicles that could achieve fuel economies up to three times those of comparable 1994 family sedans. The OAAT R&D Plan fully supports PNGV in direct injection engine research and development.

Cost sharing requirements vary within the topic area and are detailed below. All dollars are total dollars and include cost share.

Topic 2. Direct Injection Engines - Direct-injection engines have been selected by the government and PNGV as one of the most promising technology candidates for achieving the goal of 80-mpg fuel economy in a six-passenger sedan. Also, the direct injection engine has the potential to increase the fuel economy of light trucks, vans, and sport utility vehicles by 50 percent over current gasoline models. This topic is divided into two major subsections, compression-ignition direct-injected engines (CIDI), and spark-ignition direct-injected engines (SIDI). Under CIDI, the priority is to reduce emissions through aftertreatment, combustion, and fuel modifications. The CIDI section below addresses aftertreatment (Major Aftertreatment Subsystem Development section below) and combustion (contained in the Innovative Concepts R&D below). Under SIDI the priority is to reduce particulate and NO_x emissions and to improve efficiency. SIDI engine technology is discussed later in this topic area.

Compression-Ignition, Direct-Injected Engines - The primary technical barriers facing automotive CIDI engines are high oxides of nitrogen (NO_x) and particulate matter (PM) emissions. Therefore, the focus of the CIDI engine research is on NO_x and PM emissions control technology for light-duty vehicle applications under the following two

areas: Major Aftertreatment Subsystem Development and Innovative Concepts R&D. This program is undertaken so that DOE may devote considerably more effort and resources to the exhaust aftertreatment of NO_x and PM and greatly expand its efforts to involve manufacturers of aftertreatment devices, such as catalyst suppliers. Development of advanced aftertreatment technologies together with other emissions-reducing technologies is expected to enable CIDI engines to meet stringent future emission standards while maintaining high engine efficiency.

Major Aftertreatment Subsystem Development - This topic area includes the following:

(a) Develop a major aftertreatment subsystem to reduce vehicle exhaust emissions. The focus for this activity (see Figure 1) is on the aftertreatment subsystem in which the input conditions are the engine-out conditions, some of which are provided as guidelines in Table 2a. The requirements for the project that must be met by the offeror are specified in Table 2b and compared to the PNGV targets. The characteristics of the PNGV engine, for which the aftertreatment subsystem will be developed, are described in Table 2c.

Additionally, this emission control subsystem should be scalable to the higher exhaust flow rates encountered in larger CIDI engines (150 - 200 kW) used in light trucks. Given the same engine-out emissions levels, the tailpipe emissions for this larger CIDI engine should be the same as the PNGV-candidate 55-kW engine. The ratio of the aftertreatment subsystem cost to engine cost should be approximately the same for the PNGV and light truck applications.

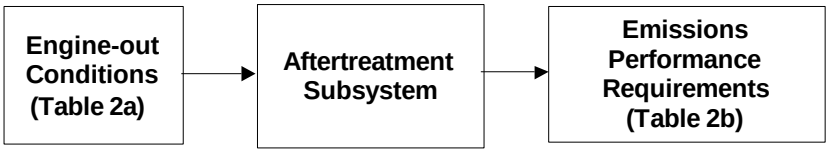

Figure 1 - Focus on Aftertreatment Subsystem

The engine-out emissions in Table 2a are research targets and are not representative of any particular production engine. The offerors are reminded that this program is NOT an engine development program but rather is focused on aftertreatment subsystems for PNGV-type engines and that the goal for this procurement is to meet the VEHICLE emissions goals. Offerors must detail their plans for achieving and verifying the engine-out conditions in Table 2a.

Vehicle emissions of Table 2b are shown in grams per mile because these are the PNGV vehicle performance targets. While this development program

is not vehicle-based, the success of the program will be evaluated in relation to vehicle requirements. This means that the offeror will be required to provide evidence through modeling, perhaps with existing vehicle models such as ADVISOR (developed by the National Renewable Energy Laboratory), that the actual results recorded with the product of their R&D program can be expected to meet the "vehicle" requirements that have been specified. DOE will work with the contractor to concur with the assumptions used. For this analysis, the offeror shall assume a conventional (non-hybrid) drivetrain. A subsystem for aftertreatment to reduce NO_x and/or PM might consist of, for example, a catalyst, sensor(s) and controllers as required, and reductant injection method/device, and any other components necessary to form a complete subsystem. All such components are considered to be part of the entire aftertreatment subsystem and therefore are included in the deliverables of this program. Aftertreatment hardware and software technologies that are emphasized in this development are:

NO_x aftertreatment: requires high NO_x conversion efficiency with adequate durability, low fuel economy penalty, and low cost (requirements detailed in Table 2b). It has been estimated that in order for PNGV-type engines to reach the desired tailpipe emissions goals, an aftertreatment subsystem must be at least 50% effective in reducing NO_x emissions, and this aftertreatment subsystem must be paired with other emissions technologies to reduce engine-out NO_x emissions. There will be trade-offs between the performance requirements for the aftertreatment subsystem and the engine-out emissions, and these balancing activities are expected as part of the work of this program. Some examples of NO_x aftertreatment approaches include, but are not limited to:

- Lean NO_x catalysis
- Lean NO_x trap
- Non-thermal plasma for NO_x reduction.

PM aftertreatment: requires high particulate reduction efficiency with adequate durability; must function in all vehicle conditions; must function with little imposed pressure drop; and must be affordable in cost (requirements detailed in Table 2b). PM emissions reductions will likely be produced with a particulate aftertreatment subsystem working in concert with combustion related PM-reducing technologies. Some examples of PM aftertreatment approaches include, but are not limited to :

- Particulate traps (regenerative)
- Particulate oxidation systems.

Aftertreatment subsystem model: requires the development of a model which will predict aftertreatment performance under a variety of input conditions.

DOE acknowledges that many experts now believe that low-sulfur diesel fuel will be required for many candidate aftertreatment subsystems to perform at the levels required in this program. In an ideal situation, aftertreatment subsystems developed in this program would achieve successful results with today's commonly available diesel fuel (higher sulfur levels). However, recognizing that this might not be possible, DOE will allow flexibility in selection of fuel for this program, subject to DOE approval, with the following stipulations:

- Fuel used in this R&D program must be an available diesel fuel or blend that is produced in a refinery process, not a laboratory-blended fuel and not a neat "alternative" fuel such as dimethyl ether or methanol.
- Fuel used must contain a minimum of 50 ppm sulfur but no more than 500 ppm sulfur.
- Offerors must detail their plans for fuels to be used in the R&D program in their proposals. Examples of representative fuels and their properties are detailed in Table 2d.

Teams, Funding Levels, Length of Program - DOE anticipates that one or two teams will be selected. Each team will be funded at about $20 million total, including contractor cost share over 2.5 years. Because of the high-risk nature of this work, a minimum 35% contractor cost share is required. A major DOE program objective is to increase the involvement of the automotive industry supplier base in key CIDI engine-related R&D programs. Therefore, a typical team for this program might include a catalyst or other aftertreatment device manufacturer together with modelers, and sensor/controller manufacturers, and others as appropriate.

Deliverables

7 months - results of performance model and preliminary aftertreatment subsystem hardware design.

15 months - test results on aftertreatment prototype hardware and/or component tests and updated modeling results.

30-months - delivery of complete aftertreatment subsystem suitable for evaluation with a 55 kW PNGV-type engine to Oak Ridge National Laboratory (ORNL). After evaluation at ORNL, the aftertreatment subsystem may be delivered to PNGV partners for further evaluation. The contractor(s) shall also provide fuels analyses data for the fuel used to qualify their aftertreatment subsystems in addition to a quantity of the fuel itself sufficient for the validation tests at Oak Ridge National Laboratory. The contractor(s) shall provide a completed

aftertreatment subsystem model validated by test results and a cost analysis for high-volume production of the aftertreatment subsystem.

CIDI Innovative Concepts R&D - Innovative Concepts R&D covers longer-term, higher-risk, and high-priority component technology needs for CIDI emissions control. While driven by the specific requirements of the PNGV-type engine, this research covers innovative approaches that may not be viable within the 2004 time frame of the PNGV, but hold the promise for cost-effectively achieving substantial reductions in CIDI emissions. Innovative Concepts R&D is intended for highly focused applications on critical components and subsystems that have potential for contributing to achieving cost and performance goals when integrated into a complete powertrain system.

Also, these emission control components should be applicable to the higher exhaust flowrates encountered in larger CIDI engines (150 - 200 kW) used in light trucks. Given the same engine out emissions level, the tail pipe out emissions for the larger CIDI engine, using the developed components, should be the same as the PNGV-candidate 55-kW engine or a EPA Tier 2 levels. The cost of these components should be proportional to engine power.

Since the engine is a complete system, it is recognized that innovations may require changes in more than one area to achieve the desired goals. Therefore, proposals that overlap two or more subject areas will be allowed (e.g., a change in the fuel injection system may lead to reduced NO_x emission because it permits higher EGR levels without an increase in PM emissions than was previously possible.) Furthermore, an offeror must demonstrate a clear understanding of how the proposed concept(s) can be integrated into the CIDI engine system while meeting the long-term emission control technology requirements.

Offerors must demonstrate through hardware testing that they can meet or have the potential to meet the DOE technical and cost targets when they are integrated into a complete engine system. Where appropriate, hardware testing should be done at actual scale. At the conclusion of the development effort, the resultant hardware should be delivered to the ORNL.

DOE anticipates that several projects of up to 2 years duration will be awarded. Each award will be funded at $0.5 to $1 million total, including contractor cost share. The minimum required contractor cost share is 25%. Innovative concepts of interest are:

(b) Fundamental investigations of the in-cylinder combustion processes with the objective of altering the interaction between PM and NO_x emissions. The trade-off between emissions of PM and NO_x is one of the critical challenges to the CIDI engine. Innovations that can alter this trade-off are sought .

(c) Development of novel aftertreatment devices for NO_x removal/conversion, including but not limited to catalysts, traps, and non-thermal plasmas. The space velocities for these improved aftertreatment devices are to be comparable to those experienced in current production catalytic converters. Improved devices must demonstrate a NO_x reduction of more than 60% for catalysts and 98% for traps and plasma systems in a production-type configuration using fuel containing at least 50 ppm sulfur. Fuel economy penalties associated with aftertreatment are not to exceed 5% of the fuel consumption of the engine. Offerors must provide in the proposal comparative data on the performance of current state-of-the-art technology versus projected performance of the proposed design .

(d) Development of improved methods for implementing EGR (exhaust gas recirculation) or other means of charge dilution over a broad range of dilution levels and engine operating conditions. EGR has been shown to be effective in reducing NO_x but with penalties in PM emissions, reduced power density (power per displacement), and parasitic losses associated with the gas circulation. Advancements are sought that will allow higher dilution levels over a wider range of operating conditions, better control of transients, and/or have with fewer penalties in terms of PM and power density than current EGR systems. Advanced EGR systems must demonstrate a capability to provide engine-out $NO_x < 1.4$ g/kW-h (i.e., without aftertreatment) and engine-out PM < 0.15 g/kW-h for the FTP test.

(e) Development of improved fuel-injection systems and/or demonstrations of improved fuel-injection strategies. Advancements are sought for innovations which will reduce emissions and noise, improve efficiency, and/or reduce costs over current fuel-injection systems. Specifically, improvements are sought in the following areas:

- Pilot injection - accurate metering of pilot injection quantities down to $1mm^3$;
- Real-time control of opening rate and an increased range of opening rates;
- Real-time, variable control of the change of fuel flow rate from 150 mm^3/ms^2 at a 1000 bar injection pressure down to at least 40 mm^3/ms^2;
- Faster closing at the end of injection to an average closing rate of at least -100 mm^3/ms^2 at a 1000 bar injection pressure.

(f) Other methods (other than EGR and the fuel-injection system) of altering the combustion process to reduce emissions while maintaining or improving performance. Advanced concepts for in-cylinder flows, bowl geometries, and fuel-jet/injector arrangements hold promise for reducing emissions without a penalty in engine performance. New methods are to demonstrate reductions of NO_x, PM, or a combination of NO_x and PM of more than 50% from the

targets for engine-out emissions for year 2000 (see Table 2a). Offerors must provide in the proposal comparative data on the performance of current state-of-the-art technology versus projected performance of the proposed design.

(g) Development of new onboard sensors for improved feedback control of the combustion process. Innovations are sought for cost effective and durable sensors for nitrogen oxides (NO or NO_x), PM emissions, and combustion heat-release rate. For an engine meeting the 2000 PNGV emission levels, the sensors must be capable of detecting 90% of the PM or NO_x (NO_x concentrations may be assumed to be 80% of the total NO_x) emissions over the FTP. Data rates are to be at least 1 Hz.

(h) Demonstration of new test methods or new devices for making laboratory PM measurements, particularly for techniques that improve sensitivity and/or allow near real-time, transient analysis of total PM emissions and/or the dry particulate or soluble organic fraction of the total PM. Innovations are sought that can determine particle size distribution and measure concentrations of less than 0.04 mg/m^3 at data rates greater than 20 Hz.

(i) Development of improved technology for boosting intake air pressure. All types of boosting systems may be considered including (but not limited to) turbochargers, electrically assisted turbochargers, and superchargers. Innovations are sought in one or more of the following areas:

- Cost - improvements that will reduce the cost (in mass production) of the boosting system by at least 50%;
- Efficiency - boosting device efficiency improvements of more than 35% over the projected operating range;
- Low-speed boost - increased boost at low speeds by more than 35%;
- Transient response - a reduction in transient response of at least 50%.

All percentage improvements are to be relative to a state-of-the-art, variable-geometry 1998 production turbocharger. Offerors must provide in the proposal comparative data on performance of current state-of-the-art technology versus projected performance of the proposed design.

SIDI Engine Fuel Delivery and Mixing Technology- Spark Ignition Direct Injection (SIDI) engine technology is being developed to support Goals 2 and 3 of the Partnership for a New Generation of Vehicles (PNGV). The status and potential of the SIDI engine suggests that it is a likely candidate for incremental improvement of passenger car fuel economy (Goal 2) and a potential enabler for a very high fuel economy vehicle, in support of the 3x fuel economy goal (Goal 3). The Goal 3 features for the PNGV vehicle are shown in Table 2e. Although SIDI engines for PNGV will have to meet many of the same requirements of CIDI engines, the SIDI technology

and its particular R&D needs are sufficiently different from CIDI to warrant separate efforts.

The key challenges for SIDI include reduction of NO_x, particulate matter, and unburned hydrocarbons (HC). The remaining challenge for SIDI is to improve thermal efficiency. The SIDI fuel delivery and mixture preparation system is a common thread in these challenges and is thus the key SIDI subject in this solicitation. Lack of full control and optimization of the fuel injection and fuel-air mixing process leads to incomplete combustion and/or regions of high-temperature burning that promote unburned fuel, soot, or NO_x emissions. In addition, these shortcomings can require engine throttling to maintain a combustible mixture at light loads. Today's SIDI fuel injection/mixing technology also requires a less-than-ideal compression ratio to avoid knock. Using throttling and a low compression ratio result in lower engine efficiency than desired. Maintaining the optimized fuel-air mixing over a wide load range, from idle to full power, is particularly challenging. The following research is being sought:

(j) Development of a fuel delivery/mixing subsystem to support a multicylinder engine with characteristics and technical targets outlined in Table 2f. The components may include a fuel supply pump, fuel pressure intensifier as necessary, fuel injector(s), fuel/air mixing technology, combustion technology, and injection control devices. The system shall have sufficient versatility to be adapted to base engines of major domestic auto manufacturers. The fueling system must enable SIDI engines to meet the emissions targets for PNGV shown in Table 2e (proposed Federal Tier 2, except for PM). The details of the fuel delivery system such as operating pressure, electromechanical design, and injector location are not specified here, but are left to the proposers to determine in meeting the performance requirements. The fuel is specified as gasoline that qualifies as emissions certification fuel. The engine application is expected to include a sophisticated EGR system, and the effects of EGR on system components must be considered.

A parallel, more fundamental program of laboratory R&D will be carried out on SIDI at two or more National Laboratories. Findings from these efforts would likely be available to industry development teams.

Exhaust aftertreatment is essential for SIDI engines to meet present and future emissions regulations, and those technologies are being developed in companion programs. Aftertreatment R&D in this solicitation may be proposed under "Innovative Concepts".

Teams, Funding Levels, Length of Program - DOE anticipates that one or two teams will be selected for award. Each award, including contractor cost share, may total up to $4 million over 30 months. A minimum 35% contractor cost share is required. A major DOE program objective is to increase the

cost share is required. A major DOE program objective is to increase the involvement of the domestic automotive industry supplier base in key SIDI engine-related R&D programs. Therefore, a typical team for this program might include a fuel delivery component manufacturer together with sensor/controller manufacturers and others as appropriate.

Deliverables

6 months - Concept definition, results of modeling or prelimi nary data.

15 months - Test data from a prototype system, such as data from a single-cylinder prototype engine, of sufficient detail to indicate progress toward goals, including vehicle fuel economy estimates.

30 months - Multicylinder engine verificat ion of fuel delivery and mixing systems meeting goals. The test engine with a hardware modifications installed shall be delivered to a DOE National Laboratory for independent testing and evaluation.

SIDI Innovative Concepts R&D - The purpose of the Innovative Concepts R&D is to research and evaluate novel approaches to overcoming some of the most challenging technical barriers in advanced engine development. Innovative Concepts R&D efforts in this solicitation should focus on efficiency improvements and emission reduction technologies not covered under major subsystem development for "SIDI Fuel Delivery and Mixing Technology." Components or concepts resulting from these efforts shall be delivered to a DOE National Laboratory for independent testing and evaluation and may be made available to third parties under appropriate protection of intellectual property.

DOE anticipates that several projects of up to 2 years duration will be awarded. Each award will be funded at $0.5 to $1 million total, including contractor cost share. The minimum required contractor cost share is 25%. Innovative concepts of interest are:

(k) Efficiency improvements. As described elsewhere in this work plan, among the key paths to increased efficienc y in the SIDI are eliminating throttling and increasing knock-limited compression ratio. Reduction of engine parasitic losses is also an accepted approach to improve engine efficiency. Improved boost devices and variable compression/expansion rati o systems will be considered as well. Innovative, yet technically sound approaches are sought to elevate SIDI efficiency closer to that of CIDI engines.

(l) Advanced concepts for in-cylinder emission reduction. Although related to the major s ubsystem development, "SIDI Fuel Delivery and

Mixing Technology," additional innovative concepts are invited. The efforts would be expected to focus on individual components or key enabling technologies required for in-cylinder emissions control. Examples of proposal subjects include fuel injection components, air handling devices, exhaust gas recirculation components, sensors, control algorithms, and ignition technology. Fuel additives that can reduce the buildup of deposits on injectors w ill be considered.

(m) Exhaust aftertreatment for SIDI. Innovative approaches for exhaust aftertreatment for regulated pollutants are sought. The exhaust characteristics and operating features of SIDI are different from CIDI. Therefore, prop osals are sought for R&D of full-size aftertreatment devices or bench-scale prototypes. Sensor developments specific to operation of aftertreatment devices are invited.

Table 2a. Engine-out emissions guidelines for a 55 kW CIDI engine

Engine-out Emissions Guidelines (PNGV-type engine)	Units	PNGV Target -Year 2000	PNGV Target -Year 2004
Engine-out NO_x Emissions[a]	g/kW-hr	2.0	1.4
Engine-out PM Emissions[a]	g/kW-hr	0.20	0.15

[a] Emission levels must comply with federal emission regulati ons projected to be in place when the technology is available for market introduction. Values are representative for operation over the Federal Test Procedure cycle.

Table 2b. Performance targets for a 55 kW CIDI engine aftertreatment subsystem

Performance Target	Units	PNGV Target - Year 2000	Project Requirements	PNGV Target -Year 2004
Tailpipe NO_x Emissions[a]	(g/mile)	0.3	**0.25**	0.2
Tailpipe PM Emissions [a,b]	(g/mile)	0.025	**0.018**	0.01
Emission Control Cost [c]	$/kW	5	**4.5**	4
Durability	Hours	>3500	**>4250**	>5000
Vol. of Aftertreatment Subsystem	Liters	-	**20**	-
Weight of Aftertreatment Subsystem	kg	-	**16**	-

[a] Emission levels must comply with federal emission regulations projected to be in place when the technology is available for market introduction. Values representative of operation over the Federal Test Procedure cycle.
[b] PNGV PM target has been revised to 0.01 g/mile for year 2004.
[c] High volume production: 500,000 units per year.

Table 2c Technical Targets: CIDI Engine Technologies for PNGV

Engine Characteristics	Units	Year2000	Interim Year Targets	Year2004
Peak Power Output	kW	55-65	**55**	55-65
Best Brake Thermal Efficiency [a]	%	44	**44.5**	45
Best Full Load Thermal Efficiency [b]	%	42	**42.5**	43
Displacement Power Density [c]	kW/L	42	**43.5%**	45
Specific Power	W/kg	590	**608**	625
Durability	Hours	>3500	**>4250**	>5000
Engine Cost [d,e]	$/kW	30	**30**	30
NVH (one meter noise)	dBA	94	**92**	90

[a] Ratio of mechanical power out to fuel lower heating value in.
[b] Ratio of mechanical power out to fuel lower heating value in at peak power.
[c] This is the peak power output divided by the volumetric displacement of the engine.
[d] High volume production: 500,000 units per year.
[e] Constant out year cost targets reflect the objective of maintaining engine system cost while increasing engine complexity.

Table 2d. Properties of representative CIDI standard and reformulated diesel fuels

		EPA Base Diesel Properties - US	Calif.Reference Diesel	Finnish reform. summer	Finnish reform. winter	Swedish reform. Class 2	Swedish reform. Class 1
Sulfur content	wt-%	≤0.05	≤0.05	≤0.005	≤0.005	≤0.005	≤0.001
Density at +15°C	kg/m^3	840-855	830-860	835	825	815	810
Viscosity at +40°C	mm^2/s	1.9 - 4.1	2.0 - 4.1	3.0	2.0	1.9	1.8
Dist. 95% point	°C	305-322	305-320	350	320	295	285
Cloud point	°C	-14	n/a	-5	-29	-30	-35
Cetane number		43.2-47.2	48	55	50[a]	49	≤52
Aromatic content	vol %	35.7-41.	≤10	≤20	≤20	≤20	≤5

[a] Natural cetane number, in market grades increased to >53 by additive.

Table 2e. Principal features for the PNGV Goal 3[a]

Vehicle Characteristic	Target for Year 2004
Fuel Economy	Up to 3x 1994 Technology (about 80 mpg)
Safety and Utility	Comparable to today's mid-size sedan
NO_x Emissions, g/mi	0.2
HC Emissions, g/mi	0.125
CO emissions, g/mi	1.7
PM emissions, g/mi	0.01

[a] Goal 2 is stated as "Implement commercially viable innovations from ongoing research on conventional vehicles."

Table 2f. SIDI engine characteristics and technical goals

Engine characteristic, units	Range or Goal
Number cylinders	3-4
Total Displacement, cc	1200-1500
Power output, kW	Approx. 55
Peak efficiency target, %	35-37
Cost	Within 10% of SI
Durability, hours	>5000
NO_x emissions, engine-out, g/kWh	<1.4
PM emissions, engine out, g/kWh	<0.05
HC emissions, engine-out g/kWh	<3.0
CO emissions, engine-out g/kWh	<41.0

The engine out emissions goals are approximations based on the PNGV tailpipe emissions targets. The engine-out emissions should be compiled from a composite of engine test conditions that simulate the Federal FTP. In back-calculating these engine-out targets, assumptions were made that NOx aftertreatment will be 50% effective, PM aftertreatment 30% effective, HC and CO, 85% effective. **The tailpipe emissions goals are overriding in case of discrepancies.**

STATEMENT OF OBJECTIVES

RESEARCH AND DEVELOPMENT FOR FUEL CELLS, DIRECT INJECTION ENGINES, AND FUELS: ENERGY EFFICIENCY AND RENEWABLE ENERGY TECHNOLOGY FOR TRANSPORTATION AND BUILDINGS

Fueling Infrastructure

The DOE Office of Transportation Technology is pursuing two options to supply the hydrogen required for PEM fuel cell vehicles: (1) onboard generation of hydrogen from readily available liquid fuels such as gasoline, methanol, and ethanol and (2) offboard generation of hydrogen which is stored on the vehicle. Research and development for off-board generation of hydrogen will be done in coordination with the DOE Hydrogen Program.

Topic 3. Small-scale Natural Gas Reformer Systems

When fuel cell vehicles are first introduced, their low numbers will not support large hydrogen production facilities. Therefore, small-scale, factory-built natural gas reformer systems will be required with a hydrogen production capacity of 10 kg/day. Research and development is sought for the following:

(a) Design and construction of a low-pressure natural gas reformer system. Designs for two storage options are desired: (1) liquid storage and (2) compressed gas storage. For the liquid storage option, the reformer should be part of a refueling system which contains a hydrogen liquifier, stationary storage tank, and dispensing apparatus for refueling fuel cell vehicles and other potential mobile applications. Novel liquefaction technologies such as those based on magnetic refrigeration should be evaluated for the liquid storage option. The storage system should have a minimum capacity of 10 kg of hydrogen.

Additional components for the compressed storage option include a hydrogen purification system, stationary storage tank, and dispensing apparatus for refueling fuel cell vehicles. The desired hydrogen purity is 99.95%, with ≤10 ppm CO, ≤400 pm N_2, ≤10 ppm O_2, ≤0 ppm CH_4. The storage system should include 3 tanks, each with a capacity of 3 kg of hydrogen, and be capable of supplying hydrogen to a vehicle at a pressure 34.5 MPa (5000 psia). Novel hydrogen purification techniques should be evaluated. The hydrogen compressor should be optimized for the hydrogen vehicle refueling application and suitable for low-cost mass production. The certification and use of fiber composite storage tanks should be considered along with the more traditional steel tanks.

The refueling system will be sited at a facility to be determined later by DOE. Proposers should assume an adequate supply of natural gas is available. An analysis of the high-volume manufacturing costs of a refueling station based on this technology shall be prepared. It is anticipated that the total award(s) for this activity will be $5 million, including required contractor cost share of 50 percent over three years.

PREAPPLICATION FORMAT
(Sample)

PROJECT TITLE:

PRINCIPAL INVESTIGATOR AND SUBCONTRACTOR(S)/COLLABORATOR(S):

SOLICITATION PROJECT/TOPIC AREA:

Examples: Topic 1 (a, b), Topic 1 (f), Topic 2 (d, f), Topic 3 (a)

BACKGROUND:

Brief discussion of the major issues related to the topic area that are relevant to the proposed work.

OBJECTIVES:

Statement of the objectives of the proposed work.

GENERAL APPROACH:

Brief discussion of the general approach to the work which is being proposed. Also a brief discussion of the anticipated results, the significance of the work, and the commercial potential if the project is successful.

APPROXIMATE SCHEDULE:

Identification of the major tasks and the duration of each task as well as total project length.

APPROXIMATE COST AND SOURCES OF FUNDING FOR EACH PROPOSED PHASE:

Total cost per major task identifying cost share. Total annual cost identifying cost share. Total project cost identifying cost share.

Offeror name, address, telephone, and fax number:

Name, Title, and Signature of Offeror's Certifying Representative:

Date

DOE F 4650.2
(10-91)
(All Other Editions Are Obsolete)

Department of Energy
Office of Energy Research (OER)

Face Page

OMB Control No.
1910-1400
(OMB Burden Disclosure Statement on Back)

TITLE OF PROPOSED RESEARCH:

1. CATALOG OF FEDERAL DOMESTIC ASSISTANCE #:
   81.111
2. CONGRESSIONAL DISTRICT:
   Applicant Organization's District:
   Project Site's District:
3. I.R.S. ENTITY IDENTIFICATION OR SSN:
4. AREA OF RESEARCH OR ANNOUNCEMENT TITLE/#:
   Solicitation No. DE-SC02-98EE50526
   Topic No.
   Subtopic:
5. HAS THIS RESEARCH PROPOSAL BEEN SUBMITTED TO ANY OTHER FEDERAL AGENCY?
   Yes ____ No ____
   PLEASE LIST:
6. DOE/OER PROGRAM STAFF CONTACT (if known):
7. TYPE OF APPLICATION:
   New ____ Renewal ____
   Continuation ____ Revision ____
   Supplement ____
8. ORGANIZATION TYPE:
   Local Govt. ____ State Govt. ____
   Non-Profit ____ Hospital ____
   Indian Tribal Govt. ____ Individual ____
   Other ____ Inst. of Higher Educ. ____
   For-Profit ____
   Small Business ____ Disadvan. Business ____
   Women-Owned ____ 8(a) ____
9. CURRENT DOE AWARD # (IF APPLICABLE):
   N/A
10. WILL THIS RESEARCH INVOLVE:
    10A Human Subjects No ____ If yes, ____
    Exemption No. ____ **or**
    IRB Approval Date ____
    Assurance of Compliance No: ____
    10B Vertebrate Animals No ____ If yes, ____
    IACUC Approval Date ____
    Animal Welfare Assurance No: ____
11. AMOUNT REQUESTED FROM DOE FOR ENTIRE PROJECT PERIOD $ ____
    Proposed Cost Share ____
12. DURATION OF ENTIRE PROJECT PERIOD:
    ____ (Mo/day/yr.) **to** ____ (Mo/day/yr.)
13. REQUESTED AWARD START DATE
    ____ (Mo/day/yr.)
14. IS APPLICANT DELINQUENT ON ANY FEDERAL DEBT?
    Yes (attach an explanation) ____ No ____
15. PRINCIPAL INVESTIGATOR/PROGRAM DIRECTOR NAME, TITLE, ADDRESS, AND PHONE NUMBER
16. ORGANIZATION'S NAME, ADDRESS AND CERTIFYING REPRESENTATIVE'S NAME, TITLE, AND PHONE NUMBE

SIGNATURE OF PRINCIPAL INVESTIGATOR/ PROGRAM DIRECTOR ____ Date

PI/PD ASSURANCE: I agree to accept responsibility for the scientific conduct of the project and to provide the required progress reports if an award is made as a result of this submission. Willful provision of false information is a criminal offense. (U.S. Code, Title 18, Section 1001).

SIGNATURE OF ORGANIZATION'S CERTIFYING REPRESENTATIVE ____ Date

CERTIFICATION & ACCEPTANCE: I certify that the statements herein are true and complete to the best of my knowledge, and accept the obligation to comply with DOE terms and conditions if an award is made as the result of this submission. A willfully false certification is a criminal offense. (U.S. Code, Title 18, Section 1001).

NOTICE FOR HANDLING PROPOSALS
This submission is to be used only for DOE evaluation purposes and this notice shall be affixed to any reproduction or abstract thereof. All Government and non-Government personnel handling this submission shall exercise extreme care to ensure that the information contained herein is not duplicated, used, or disclosed in whole or in part for any purpose other than evaluation without written permission except that if an award is made based on this submission, the terms of the award shall control disclosure and use. This notice does not limit the Government's right to use information contained in the submission if it is obtainable from another source without restriction. This is a Government notice, and shall not itself be construed to impose any liability upon the Government or Government personnel for any disclosure or use of data contained in this submission.

PRIVACY ACT STATEMENT
If applicable, you are requested, in accordance with 5 U.S.C., Sec. 562A, to voluntarily provide your Social Security Number (SSN). However, you will not be denied any right, benefit, or privilege provided by law because of a refusal to disclose your SSN. We request your SSN to aid in accurate identification, referral and review of applications for research/training support for efficient management of Office of Energy Research grant/contract programs.

SCOPE OF WORK (Example)

1. Statement of Work

The applicant shall investigate the electrocatalytic production of styrene from ethylbenzene in solid electrolyte fuel cells. The effort is directed toward defining optimal operating conditions for achieving high yields of styrene with simultaneous electric generation.

2. Project Description

The work to be performed consists of the following tasks:

2.1 Construction of tubular zirconia fuel cells with a platinum cathode and an iron oxide or platinum anode. Both anode materials are quite promising and a decision between the two will be made after preliminary runs.

2.2 Measurement of the styrene cell activity and yields as a function of velocity, temperature, and inlet concentration ofethylbenzene and external resistive load.

2.3 Measurement of the cell electric power output and overpotential as a function of the operating parameters described in 2.2.

2.4 Preliminary engineering and economic analysis according to the results of 2.2. and 2.3.

2.5 Final Report Preparation.

3. Performance Schedule

Task 2.1 completed after start of work.
Task 2.2 and 2.3 completed four months after start of work.
Task 2.4 completed five months after start of work.
Task 2.5 completed six months after start of work.

4. Reporting Requirement

The applicant shall provide a Final Report containing the data from the experiments performed according to Tasks 2.2 and 2.3 along with analyses and conclusions based on these data.

5. Deliverables

U.S. DEPARTMENT OF ENERGY
ASSURANCE OF COMPLIANCE
NONDISCRIMINATION IN FEDERALLY ASSISTED PROGRAMS

OMB Burden Disclosure Statement

Public reporting burden for this collection of information is estimated to average 15 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Office of Information Resources Management Policy, Plans, and Oversight, HR-4.3, Paperwork Reduction Project (1910-0400), U.S. Department of Energy, 1000 Independence Avenue, S.W., Washington, DC 20585; and to the Office of Management and Budget (OMB), Paperwork Reduction Project (1910-0400), Washington, DC 20503.

_____ (Hereinafter called the "Applicant") HEREBY AGREES to comply with Title VI of the Civil Rights Act of 1964 (Pub. L. 88-352), Section 16 of the Federal Energy Administration Act of 1974 (Pub. L. 93-275), Section 401 of the Energy Reorganization Act of 1974 (Pub. L. 93-438), Title IX of the Education Amendments of 1972, as amended, (Pub. L. 92-318, Pub. L. 93-568, and Pub. L. 94-482), Section 504 of the Rehabilitation Act of 1973 (Pub. L. 93-112), the Age Discrimination Act of 1975 (Pub. L. 94-135), Title VIII of the Civil Rights Act of 1968 (Pub. L.90-284), the Department of Energy Organization Act of 1977 (Pub. L. 95-91), the Energy Conservation and Production Act of 1976, as amended, (Pub. L. 94-385) and Title 10, Code of Federal Regulations, Part 1040. In accordance with the above laws and regulations issued pursuant thereto, the Applicant agrees to assure that no person in the United States shall, on the ground of race, color, national origin, sex, age, or disability, be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity in which the Applicant receives Federal assistance from the Department of Energy.

Applicability and Period of Obligation

In the case of any service, financial aid, covered employment, equipment, property, or structure provided, leased, or improved with Federal assistance extended to the Applicant by the Department of Energy, this assurance obligates the Applicant for the period during which Federal assistance is extended. In the case of any transfer of such service, financial aid, equipment, property, or structure, this assurance obligates the transferee for the period during which Federal assistance is extended. If any personal property is so provided, this assurance obligates the Applicant for the period during which it retains ownership or possession of the property. In all other cases, this assurance obligates the Applicant for the period during which the Federal assistance is extended to the Applicant by the Department of Energy.

Employment Practices

Where a primary objective of the Federal assistance is to provide employment or where the Applicant's employment practices affect the delivery of services in programs or activities resulting from Federal assistance extended by the Department, the Applicant agrees not to discriminate on the ground of race, color, national origin, sex, age, or disability, in its employment practices. Such employment practices may include, but are not limited to, recruitment, advertising, hiring, layoff or termination, promotion, demotion, transfer, rates of pay, training and participation in upward mobility programs; or other forms of compensation and use of facilities.

Subrecipient Assurance

The Applicant shall require any individual, organization, or other entity with whom it subcontracts, subgrants, or subleases for the purpose of providing any service, financial aid, equipment, property, or structure to comply with laws and regulations cited above. To this end, the subrecipient shall be required to sign a written assurance form; however, the obligation of both recipient and subrecipient to ensure compliance is not relieved by the collection or submission of written assurance forms.

Data Collection and Access to Records

The Applicant agrees to compile and maintain information pertaining to programs or activities developed as a result of the Applicant's receipt of Federal assistance from the Department of Energy. Such information shall include, but is not limited to the following: (1) the manner in which services are or will be provided and related data necessary for determining whether any persons are or will be denied such services on the basis of prohibited discrimination; (2) the population eligible to be served by race, color, national origin, sex, age, and disability; (3) data regarding covered employment including use or planned use of bilingual public contact employees serving beneficiaries of the program where necessary to permit effective participation by beneficiaries unable to speak or understand English; (4) the location of existing or proposed facilities connected with the program and related information adequate for determining whether

the location has or will have the effect of unnecessarily denying access to any person on the basis of prohibited discrimination; (5) the present or proposed membership by race, color, national origin, sex, age and disability in any planning or advisory body which is an integral part of the program; and (6) any additional written data determined by the Department of Energy to be relevant to the obligation to assure compliance by recipients with laws cited in the first paragraph of this assurance.

The Applicant agrees to submit requested data to the Department of Energy regarding programs and activities developed by the Applicant from the use of Federal assistance funds extended by the Department of Energy. Facilities of the Applicant (including the physical plants, buildings, or other structures) and all records, books, accounts, and other sources of information pertinent to the Applicant's compliance with the civil rights laws shall be made available for inspection during normal business hours on request of an officer or employee of the Department of Energy specifically authorized to make such inspections. Instructions in this regard will be provided by the Director, Office of Civil Rights, U.S. Department of Energy.

This assurance is given in consideration of and for the purpose of obtaining any and all Federal grants, loans, contracts (excluding procurement contracts), property, discounts or other Federal assistance extended after the date hereof, to the Applicants by the Department of Energy, including installment payments on account after such data of application for Federal assistance which are approved before such date. The Applicant recognizes and agrees that such Federal assistance will be extended in reliance upon the representations and agreements made in this assurance, and that the United States shall have the right to seek judicial enforcement of this assurance. This assurance is binding on the Applicant, the successors, transferees, and assignees, as well as the person(s) whose signatures appear below and who are authorized to sign this assurance on behalf of the Applicant.

Applicant Certification

The Applicant certifies that it has complied, or that, within 90 days of the date of the grant, it will comply with all applicable requirements, of 10 C.F.R. 1040.5 (a copy will be furnished to the Applicant upon written request to DOE).

DESIGNATED RESPONSIBLE EMPLOYEE

_____ _____

Name and Title (Printed or Typed) Telephone Number

_____ _____

Signature Date

_____ _____

Applicant's Name Telephone Number

_____ _____

Address Date

_____

Authorized Official:
President, Chief Executive Officer
or Authorized Designee

_____ _____

Name and Title (Printed or Typed) Telephone Number

_____ _____

Signature Date

CERTIFICATIONS REGARDING LOBBYING; DEBARMENT, SUSPENSION AND OTHER RESPONSIBILITY MATTERS; AND DRUG-FREE WORKPLACE REQUIREMENTS

Applicants should refer to the regulations cited below to determine the certification to which they are required to attest. Applicants should also review the instructions for certification included in the regulations before completing this form. Signature of this form provides for compliance with certification requirements under 34 CFR Part 82, "New Restrictions on Lobbying," and 35 CFR Part 85, "Government-wide Debarment and Suspension (Nonprocurement) and Government-wide Requirements for Drug-Free Workplace (Grants)." The certifications shall be treated as a material representation of fact upon which reliance will be placed when the Department of Energy determines to award the covered transaction, grant, or cooperative agreement.

1. LOBBYING

The undersigned certifies, to the best of his or her knowledge and belief, that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

2. DEBARMENT, SUSPENSION, AND OTHER RESPONSIBILITY MATTERS

(1) The prospective primary participant certifies to the best of its knowledge and belief, that it and its principals:

(a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;

(b) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery. falsification or destruction of records, making false statements, or receiving stolen property;

(c) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (1)(b) of this certification; and

(d) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

(2) Where the prospective primary participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

3. DRUG-FREE WORKPLACE

This certification is required by the Drug-Free Workplace Act of 1988 (Pub.L. 100-690, Title V, Subtitle D) and is implemented through additions to the Debarment and Suspension regulations, published in the Federal Register on January 31, 1989, and May 25, 1990.

ALTERNATE I (GRANTEES OTHER THAN INDIVIDUALS)

(1) The grantee certifies that it will or will continue to provide a drug-free workplace by:

(a) Publishing a statement notifying employees that the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance is prohibited in the grantee's workplace and specifying the actions that will be taken against employees for violation of such prohibition;

(b) Establishing an ongoing drug-free awareness program to inform employees about:

(1) The dangers of drug abuse in the workplace;

(2) The grantee's policy of maintaining a drug-free workplace;

(3) Any available drug counseling, rehabilitation, and employee assistance programs; and

(4) The penalties that may be imposed upon employees for drug abuse violations occurring in the workplace;

(c) Making it a requirement that each employee to be engaged in the performance of the grant be given a copy of the statement required by paragraph (a);

(d) Notifying the employee in the statement required by paragraph (a) that, as a condition of employment under the grant, the employee will:

(1) Abide by the terms of the statement; and

(2) Notify the employer in writing of his or her conviction for a violation of a criminal drug statue occurring in the workplace not later than five calendar days after such conviction;

(e) Notifying the agency, in writing, within ten calendar days after receiving notice under subparagraph (d)(2) from an employee or otherwise receiving actual notice of such conviction. Employers of convicted employees must provide notice, including position title, to every grant officer or other designee on whose grant activity the convicted employee was working, unless the Federal agency has designated a central point for the receipt of such notices. Notice shall include the identification number(s) of each affected grant;

(f) Taking one of the following actions, within 30 calendar days of receiving notice under subparagraph (d)(2), with respect to any employee who is so convicted:

(1) Taking appropriate personnel action against such an employee, up to and including termination, consistent with the requirements of the Rehabilitation Act of 1973, as amended; or

(2) Requiring such employee to participate satisfactorily in a drug abuse assistance or rehabilitation program approved for such purposes by a Federal, State or local health, law enforcement, or other appropriate agency;

(g) Making a good faith effort to continue to maintain a drug-free workplace through implementation of paragraphs (a),(b),(c),(d),(e), and (f).

(2) The grantee may insert in the space provided below the site(s) for the performance of work done in connection with the specific grant:

Place of Performance: (Street address, city, county, state, zip code)

_____

_____

_____

☐ Check if there are workplaces on file that are not identified here.

ALTERNATE II (GRANTEES WHO ARE INDIVIDUALS)

(1) The grantee certifies that, as a condition of the grant, he or she will not engage in the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance in conducting any activity with the grant.

(2) If convicted of a criminal drug offense resulting from a violation occurring during the conduct of any grant activity, he or she will report the conviction, in writing, within 10 calendar days of the conviction, to every grant officer or other designee, unless the Federal agency designates a central point for the receipt of such notices. When notice is made to such a central point, it shall include the identification number(s) of each affected grant.

As the duly authorized representative of the applicant, I hereby certify that the applicant will comply with the above certifications.

NAME OF APPLICANT	PR/AWARD NUMBER and/or PROJECT NAME
PRINTED NAME and TITLE OF AUTHORIZED REPRESENTATIVE	
SIGNATURE and DATE	

SIMPSON-CRAIG AMENDMENT REPRESENTATION

Check the appropriate block:

The applicant represents that it is an organizaton described in Section 501(c)(4) of the Internal Revenue Code of 1986 which, after December 31, 1995, has ☐ has not ☐ engaged in any lobbying activities as defined in the Lobbying Disclosure Act of 1995.

Applicant: _____

Title: _____

Signature and Date: _____

DISCLOSURE OF LOBBYING ACTIVITIES

Approved by OMB
0348-0046

Complete this form to disclose lobbying activities pursuant to 31 U.S.C. 1352

(See reverse for public burden disclosure.)

1. Type of Federal Action:	2. Status of Federal Action:	3. Report Type:
☐ a. contract b. grant c. cooperative agreement d. loan e. loan guarantee f. loan insurance	☐ a. bid/offer/application b. initial award c. post-award	☐ a. initial filing b. material change For Material Change Only: year _____ quarter _____ date of last report _____

4. Name and Address of Reporting Entity:	5. If Reporting Entity in No. 4 is Subawardee, Enter Name and Address of Prime:
☐ Prime ☐ Subawardee Tier ___, *if known.* Congressional District, *if known:*	Congressional District, *if known:*
6. Federal Department/Agency:	**7. Federal Program Name/Description:** CFDA Number, *if applicable* :
8. Federal Action Number, *if known:*	**9. Award Amount, if known:** $
10. a. Name and Address of Lobbying Registrant *(if individual, last name, first name, MI):*	**b. Individuals Performing Services** *(including address if different from No. 10a)* *(last name, first name, MI):*

Items 11 through 15 are deleted.

16 Information requested through this form is authorized by title 31 U.S.C. section 1352. This disclosure of lobbying activities is a material representation of fact upon which reliance was placed by the tier above when this transaction was made or entered into. This disclosure is required pursuant to 31 U.S.C. 1352. This information will be reported to the Congress semi-annually and will be available for public inspection. Any person who fails to file the required disclosure shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

Signature: _____
Print Name: _____
Title: _____
Telephone No.: _____ **Date:** _____

Federal Use Only:

Authorized for Local Reproduction
Standard Form - LLL

INSTRUCTIONS FOR COMPLETION OF SF-LLL, DISCLOSURE OF LOBBYING ACTIVITIES

This disclosure form shall be completed by the reporting entity, whether subawardee or prime Federal recipient, at the initiation or receipt of a covered Federal action, or a material change to a previous filing, pursuant to title 31 U.S.C. section 1352. The filing of a form is required for each payment or agreement to make payment to any lobbying entity for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with a covered Federal action. Complete all items that apply for both the initial filing and material change report. Refer to the implementing guidance published by the Office of Management and Budget for additional information.

1. Identify the type of covered Federal action for which lobbying activity is and or has been secured to influence the outcome of a covered Federal action.

2. Identify the status of the covered Federal action.

3. Identify the appropriate classification of this report. If this is a followup report caused by a material change to the information previously reported, enter the year and quarter in which the change occurred. Enter the date of the last previously submitted report by this reporting entity for this covered Federal action.

4. Enter the full name, address, city, state and zip code of the reporting entity. Include Congressional District, if known. Check the appropriate classification of the reporting entity that designates if it is, or expects to be a prime or subaward recipient. Identify the tier of the subawardee, e.g., the first subawardee of the prime is the 1st tier. Subawards include but are not limited to subcontracts, subgrants and contract awards under grants.

5. If the organization filing the report in item 4 checks "Subawardee", then enter the full name, address, city, state and zip code of the prime Federal recipient. Include Congressional District, if known.

6. Enter the name of the Federal agency making the award or loan commitment. Include at least one organizational level below agency name, if known. For example, Department of Transportation, United States Coast Guard.

7. Enter the Federal program name or description for the covered Federal action (item 1). If known, enter the full Catalog of Federal Domestic Assistance (CFDA) number for grants, cooperative agreements, loans, and loan commitments.

8. Enter the most appropriate Federal identifying number available for the Federal action identified in item 1 (e.g., Request for Proposal (RFP) number; Invitation for Bid (IFB) number; grant announcement number; the contract, grant, or loan award number; the application/proposal control number assigned by the Federal agency). Include prefixes, e.g., "RFP-DE-90-001."

9. For a covered Federal action where there has been an award or loan commitment by the Federal agency, enter the Federal amount of the award loan commitment for the prime entity identified in item 4 or 5.

10.(a) Enter the full name, address, city, state and zip code of the registrant under the Lobbying Disclosure Act of 1995 identified in item 4 to influence the covered Federal action.

10.(b) Enter the full name of the individual(s) performing services, and include full address if different from 10(a). Enter Last Name, First Name, and Middle Initial (MI).

(Items 11 through 15 were removed from the form.)

16. The certifying official shall sign and date the form, print his/her name, title, and telephone number.

FINANCIAL ASSISTANCE PRE-AWARD INFORMATION SHEET

Applicant: _____

Solicitation No.:

	YES	NO
A. SAFETY		
A.1. Is there any planned or potential use of radioactive material under the proposed grant?	☐	☐

If "yes":

a. Indicate type, quantity, and form of radioactive material:

b. Indicate the NRC or State License Number be under which the radioactive material will be purchased and used (report N/A if not applicable):

c. Indicate how radioactive waste (if generated) will be disposed:

A.2. Is there any planned or potential use of a radiation-producing device e.g., accelerator, reactor, x-ray machine, fusion device under the proposed grant? (For purposes of this question, "radiation" includes articles with energies in the range of KeV or higher. It does not include laser, IR, UV, or microwave radiation.)	☐	☐

If "yes", specify the type of device(s):

If 1 or 2 is "yes", identify:

a. Principal Investigator and Phone No.:

b. Health Physicist/Radiation Safety Officer and Phone No.

c. Specific location where radioactive material or radiation-producing device will be used. (Please indicate if this is a government-owned facility):

	YES	NO
	☐	☐

A.3. Is it possible for the proposed work to result in the radioactive contamination of equipment or real property? ☐ ☐

If "yes", describe the expected or potential contamination:

(NOTE: If the preceding circumstances change during the performance of the work undertaken, and any "No" answers would change to "Yes", then the Recipient shall notify the Contracting Officer prior to utilization of any radioactive material or radiation-producing device.)

B. ENVIRONMENT

B.1. Will proposed grant funds be used for acquisition and/or leasing of real property, construction, clearing of land, change in land use, or commitment of natural resources? ☐ ☐

B.2. Are any federal, state or local environmental permits necessary for work under the proposed grant? ☐ ☐

B.3. Will there be any hazardous liquid and /or solid chemical wastes to be disposed of as a result of this project? ☐ ☐

If the answer is "yes", describe the type of wastes and how they are to be disposed:

B.4. Will there be any unregulated, unique, and environmentally significant waste products generated that are not covered by permits presently used? ☐ ☐

B.5. Will exotic species of organisms be used under the terms of the grant? ☐ ☐

C. INTELLECTUAL PROPERTY

C.1. THE RECIPIENT IS:

☐ A University or other institution of higher education or an organization of the type described in Section 501(c)(3) of the Internal Revenue Code of 1954 (26 U.S.C. 501(c)) and exempt from taxation under Section 501(a) of the Internal Revenue Code (26 U.S.C. 501(a)); or

☐ A nonprofit scientific or educational organization qualified under a State nonprofit organization statute. Please identify the statute.

☐ A small business concern as defined at Section 2 of Public Law 85-536 (15 U.S.C. 632) and implementing regulations of the administrator of the Small Business Administration.

☐ None of the above.

Recipients who have checked NONE OF THE ABOVE have the right to request, in advance of or within 30 days after execution of the grant, in accordance with applicable statutes and DOE Procurement Regulations (9-9, 109-6), a waiver of all or any part of the rights of the United States in Subject Inventions.

	YES	NO
Do you intend to request an advance waiver in accordance with DOE PR 9-9.109-6?	☐	☐

C.2. RIGHTS IN PROPOSAL DATA

It is DOE policy for a grant award based on a proposal that, in consideration of the award, the Government shall obtain unlimited rights in the technical data contained in the proposal unless the recipient marks those portions of the technical information which he asserts as "proprietary data" or specifies those portions of such technical data which are not directly related to or will not be utilized in the work to be funded under the grant.

Will restrictions be placed on Government rights in the proposal technical data?	☐	☐

If yes, identify below the technical data that is proprietary or is not directly related to or will not be utilized in the work to be funded under the grant:

_____

_____

_____

C.3. IDENTIFICATION OF TECHNICAL DATA WHICH IS PROPRIETARY

The Rights in Technical Data clause proposed to be used for this grant may not permit the utilization of proprietary data in the grant work or, if the use of proprietary data is permitted, may not be adequate to meet programmatic requirements. Use of data which is proprietary may prevent you from meeting the data requirements of the grant (including delivery of data). Your attention is particularly drawn to the use of LICENSED COMPUTER SOFTWARE.

	YES	NO
Will proprietary data be utilized in the grant work?	☐	☐

If yes, identify below the proprietary data that will be utilized in the grant work:

_____

_____

_____

Will LICENSED COMPUTER SOFTWARE be utilized in the grant work (by the recipient or any lower tier contractor)?	☐	☐

If yes, identify the LICENSED COMPUTER SOFTWARE that will be utilized in the grant work:

_____

_____

_____

_____

D. HUMAN RESEARCH

D.1. Does this research work involve the use of human subjects ☐ ☐

D.2. Do you intend to award a subcontract that would require research work involving human subjects? ☐ ☐

D.3. If the answer is yes to either of the foregoing questions, indicate the name, title, and telephone number of a point of contact(s) who can provide detailed information concerning this research project:

Name: _____

Title: _____

Telephone No.:_____

E. TYPE OF BUSINESS (IF NOT SPECIFICALLY IDENTIFIED IN SECTION C.1. OF THIS PRE-AWARD INFORMATION SHEET)

The Recipient is a:

☐ Individual ☐ Partnership ☐ State or Local Government

☐ Joint Venture ☐ Other (Identify)

F. SOCIAL SECURITY NUMBER (SSN)

If the Recipient does not have an Internal Revenue Service (IRS) assigned Employer Identification Number (EIN), Recipient SSN is _____. (See block 5 of Grant Application, Standard Form 424.)

G. CONGRESSIONAL DISTRICT AND COUNTY

For the principal place of performance, the Congressional District is _____ and the county is _____.

_____
(Organization Name)

_____ _____
(Signature) (Date)

_____
Name and Title of Authorized Representative

H. PAYMENT INFORMATION (FOR NEW AWARDEES ONLY)

Financial Institution Name _____

Address _____

_____

Depositor Account Number _____

Note: Please complete SF 3881 entitled ACH VENDOR/Miscellaneous Payment - Enrollment Form.

ACH VENDOR/MISCELLANEOUS PAYMENT ENROLLMENT FORM

OMB No. 1510-0056
Expiration Date 06/30/93

This form is used for Automated Clearing House (ACH) payments with an addendum record that contains payment - related information processed through the Vendor Express Program. Recipients of these payments should bring this information to the attention of their financial institution when presenting this form for completion.

PRIVACY ACT STATEMENT

The following information is provided to comply with the Privacy Act of 1974 (P.L. 93-579). All information collected on this form is required under the provisions of 31 U.S.C. 3322 and 31 CFR 210. This information will be used by the Treasury Department to transmit payment data, by electronic means to vendor's financial institution. Failure to provide the requested information may delay or prevent the receipt of payments through the Automated Clearing House Payment System.

AGENCY INFORMATION

FEDERAL PROGRAM AGENCY
U.S. DEPARTMENT OF ENERGY - CHICAGO OPERATIONS OFFICE

AGENCY IDENTIFIER:	AGENCY LOCATION CODE (ALC):	ACH FORMAT:
DOE2	***89-00-0701***	☒ CCD + ☐ CTX ☐ CTP

ADDRESS:
FINANCIAL SERVICES GROUP
9800 SOUTH CASS AVENUE, ARGONNE, IL 60439

CONTACT PERSON NAME:	TELEPHONE NUMBER
KIMBERLI POWERS	***630/252-2344***

ADDITIONAL INFORMATION:

PAYEE/COMPANY INFORMATION

NAME	SSN NO. OR TAXPAYER ID NO.
ADDRESS	
CONTACT PERSON NAME	TELEPHONE NUMBER:

FINANCIAL INSTITUTION INFORMATION

NAME

ADDRESS

ACH COORDINATOR NAME:	TELEPHONE NUMBER:

NINE-DIGIT ROUTING TRANSIT NUMBER:
___ ___ ___ ___ ___ ___ ___ ___ ___

DEPOSITOR ACCOUNT TITLE:

DEPOSITOR ACCOUNT NUMBER:	LOCKBOX NUMBER:

TYPE OF ACCOUNT:
☐ CHECKING ☐ SAVINGS ☐ LOCKBOX

SIGNATURE AND TITLE OF AUTHORIZED OFFICIAL: (Could be the same as ACH Coordinator)	TELEPHONE NUMBER:

Solicitation No.: DE-PS02-98EE50526
Company Name:_____
Address: _____
_____
_____
_____
Project Total Est. Cost: $_____
Project Title: _____

To be completed by Applicant company and proposed subcontractors with estimated costs of over $100,000.00.

EPACT REPRESENTATION

Section 2306 of the Energy Policy Act of 1992, Pub. L. 102-486 establishes eligibility requirements for companies to participate in certain financial assistance programs covered under Titles XX through XXIII of the EPAct. For this purpose, "company" means any business entity other than an organization of the type described in section 501 (c)(3) of the Internal Revenue Code of 1954 [26 U.S.C. Section 501(c)(3)].

In order for the Department of Energy (DOE) to make an award to a company under a covered program, DOE must determine that the company's participation will be in the economic interest of the United States and, if the company is not a United States-owned company, that the parent company is incorporated in a foreign country that: affords national treatment to United States-owned companies with regard to access to Government-supported joint ventures in energy research and development; affords national treatment to United States-owned companies with regard to general investment opportunities; and affords protection to intellectual property rights owned by United States - owned companies. To assist DOE in making these determinations, the applicant must answer the following questions and make the representation provided therein. In the event the information submitted is inadequate for DOE to make a determination, DOE will request such additional information as may be required.

Company Ownership Information:
(include this information for each participant in a joint venture)

		Yes	No
1.	Is your company a United States-owned company?	☐	☐

(Check as applicable)

a. Applicant company has the majority ownership by individuals who are citizens of the United States, ☐ × if applicable

b. Company applicant is organized under the laws of a State, and either has no parent company or has a parent company organized under the laws of a State. ☐ × if applicable

c. State incorporated: _____
Applicant Company

d. Date incorporated: _____
Applicant Company

2. Identify the Parent Company, state in which the parent company is _____

incorporated or organized, and the date incorporated.

Parent Co. Name
_____
State Incorporated
_____
Date Incorporated

3. Parent Company is foreign owned; organized in the following Country: _____.

Economic interest information:	Yes	No
1. Will this project result in investments in the U.S. in research and development?	☐	☐
If the answer is yes, what percentage of the total estimated cost of the project will be expended in the U.S.? (Contractor and supplier costs are to be included in total estimated costs.) Also, express in terms of dollars.	_____% $_____	
If no, explain fully.		
2. Will this project result in investments in U.S. in manufacturing?	☐	☐
If the answer is yes, what percentage of the total estimated cost of the project including contractor and supplier costs will be expended in U.S. manufacturing? Also, express in terms of dollars.	_____% $_____	
Check if applicable The proposed research is in its infancy. Depending upon the progress of the research, manufacturing may take place in the future.		
3. Will this project contribute to U.S. employment?	☐	☐
If the answer is yes, briefly describe how. (i.e. How many current employees will the project support? New hires anticipated.)		
If no, explain fully.		
	Yes	No
4. Does, the Applicant agree that it will promote the manufacture within the U.S. of products resulting from any resultant technology and competitively procure parts and materials?	☐	☐
Briefly describe plans, if any, for any manufacturing		

of products arising from the program supported research and development, including the location where such manufacturing is expected to occur.

If your answer is no, please explain.

5. What other benefits to the U.S. will result from this project?

6. Provide a brief summary of the project objectives. The overall project objective is to design and develop a _____ which includes development of the following subsystems:
(1)

(2)
etc.

The applicant hereby agrees to comply with Section 2306 of the Energy Policy Act (Pub. L. 102- 486). In accordance with the above law, the applicant represents that its participation in this financial assistance program would be in the economic interest of the United States based upon its investments in the United States in research, development, and manufacturing, and its contributions to employment in the United States. The applicant agrees with respect to any technology arising from this financial assistance to promote the manufacture of products within the United States and to procure parts and materials from competitive suppliers.

To the best of its current knowledge and belief, the applicant represents that the information provided is current, accurate, and complete and will advise DOE of any changes prior to award.

Company Name: _____

Signature: _____

Title: _____

Date: _____

Telephone No.:_____

EPAct REPRESENTATION TO BE COMPLETED BY U.S. APPLICANT COMPANY AND

U.S. PROPOSED SUBCONTRACTORS (with estimated costs of UNDER $100,000)

Check one block and complete as applicable.

☐ _____ (Hereinafter called the "Applicant") represents that it is a United States-owned company. (A company that has majority ownership by individuals who are citizens of the United States or a company organized under the laws of a State that either has no parent company or has a parent company organized under the laws of a State.)

_____	_____	_____
Parent Co. Name	State Parent Co. Incorporated	Date Parent Co. was Incorporated

☐ _____ (Hereinafter called the "Applicant") represents that it or its parent company is incorporated or organized in the following Country:_____

The applicant hereby agrees to comply with Section 2306 of the Energy Policy Act (Pub. L. 102-486). In accordance with the above law, the applicant represents that its participation in this financial assistance program would be in the economic interest of the United States based upon its investments in the United States in research, development, and manufacturing, and its contributions to employment in the United States. The applicant agrees with respect to any technology arising from this financial assistance to promote the manufacture of products within the United States and to procure parts and materials from competitive suppliers.

Provide a brief summary of the project objectives

Company Name: _____
Address: _____
_____
_____
_____
State Incorporated: _____
Date Incorporated: _____

_____ _____
Signature Date

_____
Title

CHICAGO OPERATIONS OFFICE
NATIONAL ENVIRONMENTAL POLICY ACT
ENVIRONMENTAL EVALUATION NOTIFICATION FORM

Organization's Name: _____

Title Of Proposed Research: _____

Topic Number: _____ Subtopic Number: _____

Funding Source: (EE) _____

Contractor Project Manager: _____ Signature: _____

Phone Number: _____ Date: _____

Contractor NEPA Reviewer: _____ Signature: _____

Phone Number: _____ Date: _____

For information on filling out this sheet call: 630-252-2101 (W. S. White)

I. **Description of Proposed Research:**

II. **Description of Affected Environment:**

III. **Potential Environmental Effects:**

NOTE: Attach explanation for each "yes" response. Additional information is important and could be significant in the decision making process.)

A. Sensitive Resources: Will the proposed action result in changes and/or disturbances to any of the following resources?

		Yes/No
1.	Threatened/Endangered Species and/or Critical Habitats	__ __
2.	Other Protected Species (e.g. Burros, Migratory Birds)	__ __
3.	Wetlands	__ __
4.	Archaeological/Historic Resources	__ __
5.	Prime, Unique or Important Farmland	__ __
6.	Non-Attainment Areas	__ __
7.	Class I Air Quality Control Region	__ __
8.	Special Sources of Groundwater (e.g. Sole Source Aquifer)	__ __
9.	Navigable Air Space	__ __
10.	Coastal Zones	__ __
11.	Areas w/Special National Designation (e.g. National Forests, Parks, Trails)	__ __
12.	Floodplain	__ __

B. Regulated Substances/Activities: Will the proposed action involve any of the following regulated substances or activities?

		Yes/No
13.	Clearing or Excavation (indicate if greater than 5 acres)	__ __
14.	Dredge or Fill (under Clean Water Act section 404; indicate if greater than 10 acres)	__ __
15.	Noise (in excess of regulations)	__ __
16.	Asbestos Removal	__ __
17.	PCBs	__ __
18.	Import, Manufacture or Processing of Toxic Substances	__ __
19.	Chemical Storage/Use	__ __
20.	Pesticide Use	__ __
21.	Hazardous, Toxic, or Criteria Pollutant Air Emissions	__ __
22.	Liquid Effluent	__ __
23.	Underground Injection	__ __
24.	Hazardous Waste	__ __
25.	Underground Storage Tanks	__ __
26.	Radioactive (AEA) Mixed Waste	__ __
27.	Radioactive Waste	__ __
28.	Radiation Exposures	__ __

C. Other Relevant Disclosures. Will the proposed action involve the following?

		Yes/No
29.	A threatened violation of ES&H regulations/permit requirements	__ __
30.	Siting/Construction/Major Modification of Waste Recovery, or TSD Facilities	__ __
31.	Disturbance of Pre-existing Contamination	__ __
32.	New or Modified Federal/State Permits	__ __
33.	Public controversy (e.g. Environmental Justice Executive Order 12898	__ __

consideration and other related public issues)

34. Action/involvement of Another Federal Agency (e.g. license, funding, approval) __ __
35. Action of a State Agency in a State with NEPA-type law. (Does the State Environmental Quality Review Act Apply?) __ __
36. Public Utilities/Services __ __
37. Depletion of a Non-Renewable Resource..... __ __
38. Is the proposed work bench-top research... __ __
39. Will the proposed work be preformed in an existing laboratory setting __ __
40. Is the proposed work a paper study rather than laboratory bench-top research __ __

(If you have answered yes to any question above, attach an explaination why "yes" was checked)

NOTE: Do not complete any information below. This information will be completed at the Chicago Operation Office

IV. **Section D Determination**: Is the project/activity appropriate for a determination by the OM under Subpart D of the DOE NEPA Regulations for compliance with NEPA?

Yes

A. **DOE-CH NEPA Coordinator Review**:

Indicate the recommendation and specific class of action from Appendix A-D to Subpart D (10 CFR 1021):

CX

Category:

DOE-CH ACQ Review: Renee L. Irwin

Signature :_____ Date:_____

B. DOE CH NEPA Coordinator Review:

Concurrence with Proposed Class of Action Recommended

Category:

DOE CH NEPA Reviewer: _____

Signature:_____ Date:_____

CH LGL: _____

Signature:_____ Date:_____

The preceding pages are a record of documentation required under DOE Final NEPA Regulation, 10 CFR Part 1021.400 that establishes an action may be categorically excluded from further NEPA review. I have determined that the proposed action meets the requirements for the Categorical Exclusion referenced above. Therefore by my signature below, I have determined that the proposed action may be categorically excluded from further NEPA review and documentation.

DOE CH NCO Reviewer: W. Sedgefield White
Phone No.: 630-252-2101

Signature: _____ Date: _____

DOE F 4620.1 (04-93) All Other Editions Are Obsolete	**U.S. Department of Energy** **Budget Page** (See reverse for Instructions)			OMB Control No. 1910-1400 OMB Burden Disclosure Statement on Reverse
ORGANIZATION			Budget Page No:	
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR			Requested Duration: _____ (months)	
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title; A.6. show number in brackets)	Hrs	$/hr.	DOE SHARE	COST SHARE BY APPLICANT	TOTAL COSTS
1.					
2.					
3.					
4.					
5.					
6. ( ) OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)					
7. ( ) TOTAL SENIOR PERSONNEL (1-6)					
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. ( ) POST DOCTORAL ASSOCIATES					
2. ( ) OTHER PROFESSIONAL (TECHNICIAN, PROGRAMMER, ETC.)					
3. ( ) GRADUATE STUDENTS					
4. ( ) UNDERGRADUATE STUDENTS					
5. ( ) SECRETARIAL - CLERICAL					
6. ( ) OTHER					
TOTAL SALARIES AND WAGES (A+B)					
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A+B+C)					
D. PERMANENT EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM.)					
TOTAL PERMANENT EQUIPMENT					
E. TRAVEL 1. DOMESTIC (INCL. CANADA AND U.S. POSSESSIONS)					
2. FOREIGN					
TOTAL TRAVEL					
F. TRAINEE/PARTICIPANT COSTS					
1. STIPENDS (Itemize levels, types + totals on budget justification page)					
2. TUITION & FEES					
3. TRAINEE TRAVEL					
4. OTHER (fully explain on justification page)					
TOTAL PARTICIPANTS ( ) TOTAL COST					
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES					
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					
3. CONSULTANT SERVICES					
4. COMPUTER (ADPE) SERVICES					
5. SUBCONTRACTS					
6. OTHER					
TOTAL OTHER DIRECT COSTS					
H. TOTAL DIRECT COSTS (A THROUGH G)					
I. INDIRECT COSTS (SPECIFY RATE AND BASE)					
TOTAL INDIRECT COSTS					
J. TOTAL DIRECT AND INDIRECT COSTS (H+I)					
K. AMOUNT OF ANY REQUIRED COST SHARING FROM NON-FEDERAL SOURCES					
L. TOTAL COST OF PROJECT (J+K)					
			DOE	APPLICANT	TOTAL

BUDGET EXPLANATION PAGE

Budget

The budget is reported on the Budget Page, DOE F 4620.1. Form DOE F 4620.1 is provided in Appendix N. Section A of the budget form does not need to be completed. For each year you propose costs, submit a separate budget form with a budget explanation for each cost element proposed as described below. Also, submit a summary total covering the entire project period on a separate form by major tasks. On a separate page(s), provide a cost breakdown of the proposed budget by major tasks and a month by month spending plan for the duration of the project.

The following budget explanation is required for the proposed budgeted cost elements. Additionally, teaming members and subcontractors are also required to submit the below information with their budgets.

Personnel

In support of the proposed personnel costs, please provide a supplemental schedule that identifies the labor hours, labor rates, and cost by labor classification for each budget year. Also, indicate the basis for the labor classification, number of hours, and labor rates. An example of the basis for the labor classification and number of hours could be past experience, engineering estimate, etc. An example of the basis for the labor rates could be actual rates for the individuals who will perform the work or an average labor rate for a labor classification or a departmental average rate.

Fringe Benefits

Provide the method used to calculate the proposed rate amount. If a fringe benefit has been negotiated with or approved by a government agency, provide a copy of the agreement. If no rate agreement exists, provide the method used to calculate the proposed amount. See Indirect Costs.

Travel

For each proposed trip, provide the purpose, number of travelers, travel origin and destination, number of days, and a breakdown of costs for airfare, lodging, meals, and incidentals. The basis for the airfare, lodging, meals, and incidentals must be provided, such as past trips, current quotations, Federal Travel Regulations, etc.

Equipment
Provide an itemized list of each piece of equipment, individual costs, and the basis for estimating the cost, for example, vendor quotes, catalog prices, prior invoices, etc.

Contractual
Include in this category the cost of consultants and subcontractors.

Consultants
Provide the hourly or daily rate along with the basis for the rate. Furnish resumes or similar information regarding qualifications or experience. Provide at least two invoices reflecting hourly or daily rates charged to customers other than the Government. A statement signed by the consultant certifying his or her availability and salary must be provided. If travel or incidental expenses are to be charged, give the basis for these costs.

Subcontractors
Provide the total cost per year for each subcontractor. Details of subcontractors' costs should appear in the subcontractors' budget explanation.

Construction
Not applicable.

Other Direct Costs
Provide an itemized list with costs for any other item proposed as a direct cost and state the basis for each proposed item.

Indirect Costs
If indirect rates have been negotiated with or approved by a federal government agency, please provide a copy of the latest rate agreement. If you do not have a current rate agreement, submit an indirect cost rate proposal based on the model provided in Appendix P for evaluation and negotiation. In either case, provide a breakdown of the proposed indirect costs for each of your accounting periods included in the proposal. Identify the rate and allocation base for each indirect cost, such as Overhead, General and Administrative, Facilities Capital Cost of Money, etc.

Model Indirect Cost Rate Proposal

This model is to be used as a guide in preparing an indirect cost rate submission. The formats included in this model are not mandatory, however the basic data contained in each of the schedules listed below is required for the proposal to be considered adequate. Please note that depending on the size of a firm or organization, complexity of the accounting system, and type of business, some of the schedules may not be required.

The proposal should be prepared on the basis of the firm or organization's fiscal year.

List of required schedules:

Schedule A - General and Administrative Expenses (G&A)

Schedule B - Overhead Expenses

Schedule D - Bases Used to Allocate Indirect Expenses

Schedule E - Claimed Rates for Each Expense Pool

Schedule F - Facilities Capital Cost of Money Factors Computation

Schedule G - Reconciliation of Books of Account and Claimed Direct Cost

Schedule L - Reconciliation of Total Payroll to Total Labor Distributed

General and Administrative Expenses (G&A)
Fiscal Year Ended 3/31/90

Schedule of Actual Expenses, Adjustments and Claimed Costs

Accounts	Expenses Per General Ledger	Adjustments		Claimed Costs	Notes
Salaries & Wages	$ 90,007	$		$ 90,007	
Legal Fees	1,744			1,744	
Audit Fees	20,585			20,585	
Other Fees	11,776			11,776	
Travel	12,987	(1,295)		11,692	(1)
Entertainment	484	(484)		0	(2)
Advertising & Promotion	354	(287)		67	(3)
Bad Debts	3,018	(3,018)		0	(2)
Tech. Publications	1,500			1,500	
Periodicals	4,935			4,935	
Conventions & Seminars	7,936	(319)		7,617	(1)
Interest Expense	1,001	(1,001)		0	(2)
Holiday	2,322			2,322	
Vacation	5,812			5,812	
Sick Leave	987			987	
Personal Absence	1,082			1,082	
Employee FICA	3,815			3,815	
FUI	183			183	
SUI	910			910	
Workmen's Compensation	516			516	
Health Insurance	8,912			8,912	
Life Insurance	1,087			1,087	
Pension Plan	12,318	(1,883)		10,435	(4)
Tuition Assistance	912			912	
Miscellaneous	2,445			2,445	
SUBTOTAL	197,628	(8,287)		189,341	
Occupancy Allocation-Sch C	23,151			23,151	
SUBTOTAL	220,779	(8,287)		212,492	
IR&D/B&P					
IR&D	9,724			9,724	
IR&D	14,287			14,287	
IR&D	11,822	(715)	@77.74%	11,107	(5)
B&P	6,485			6,485	
B&P	9,525			9,525	
B&P	7,882	(477)	@77.74%	7,405	(5)
IR&D/B&P Overceiling-Sch J		(586)		(568)	(6)
GRAND TOTAL	280,504	($ 10,047)		270,457	

Notes Explaining Adjustments :

(1) Expense of President, Vice President and wives on a personal trip not claimed.

(2) Unallowable cost per government procurement regulation FAR 31.2.

(3) Unallowable promotion expense; balance claimed is help-wanted employment advertisement.

(4) Employer contributions to pension plan in excess of that approved and considered allowable by the ACO.

(5) Overhead on IR&D/B&P labor is shown at both the General Ledger rate of 82.75% and the claim rate of 77.74%.

(6) See Schedule J for computation of allowable IR&D/B&P costs.

Overhead Expenses
Fiscal Year Ended 3/31/90

Schedule of Actual Expenses, Adjustments and Claimed Costs

Accounts	Expenses Per General Ledger	Adjustments		Claimed Costs	Notes
Salaries & Wages	$ 33,060	$		$ 33,060	
Postage & Handling	6,235			6,235	
Office Supplies	6,461			6,461	
Small Equipment	878			878	
Temp. Clerical Help	1,816			1,816	
Other Outside Services	30,281			30,281	
Relocation	1,216	(777)		439	(1)
Business Meals	2,702			2,702	
Telephone Expense - Local	1,814			1,814	
Telephone-Long Distance	43,738			43,738	
Telecopier	2,434			2,434	
Equipment Rent	27,151			27,151	
Recruitment	286			286	
Dues/Memberships	2,112	(500)		1,612	(2)
Insurance	737			737	
Depreciation/Amortization	2,824			2,824	
Repairs & Maintenance	1,681			1,681	
Holiday	20,181			20,181	
Vacation	25,440			25,440	
Sick Leave	14,318			14,318	
Severance Pay	32,419	(23,023)		9,396	(3)
Employer FICA	23,612			23,612	
FUI	1,210			1,210	
SUI	5,813			5,813	
Workmen's Compensation	3,311			3,311	
Health Insurance	31,097			31,097	
Life Insurance	6,833			6,833	
Pension Plan	58,320	(8,612)		49,708	(4)
Miscellaneous	612			612	
SUBTOTAL	388,592	($ 32,912)		355,680	
Occupancy Allocation-Sch C	154,932			154,932	
SUBTOTAL	543,524	(32,912)		510,612	
GRAND TOTAL	543,524	($ 32,912)		510,612	

Notes Explaining Adjustments :

(1) Moving charges in excess of those allowable by FAR 31.2.

(2) Membership fees and tennis dues of one individual - not allowable as per FAR 31.2.

(3) Severance pay in excess of allowable as per direction of ACO.

(4) Employer contributions to pension plan I excess of that approved and considered allowable by ACO.

Bases Used to Allocate Indirect Expenses
Fiscal Year Ended 3/31/90

Pool General and Administrative Expenses - Schedule A :

Base Total cost input (excludes G&A, IR&D, B&P, and Cost of Money), see Schedule E.

Pool Overhead Expenses - Schedule B:

Base Straight time direct labor dollars of all contracts and projects including labor costs of IR&D/B&P projects, see Schedules E and H.

Pool Occupancy Expenses - Schedule C:

Base Square feet assigned to each activity

Pool Cost of Money (Overhead) - Schedule F:

Base Straight time direct labor dollars of all contracts and pro jects including labor costs of IR&D/B&P projects.

Pool Cost of Money (G&A) - Schedule F:

Base Total cost input, (excludes G&A, IR&D, B&P, and Cost of Money.)

Claimed Rates for Each Expense Pool
Fiscal Year Ended 3/31/90

	General Ledger	Adjustments	Claimed Costs	
Overhead				
Overhead Base:				
Contract Labor - Schedule H	$633,012		$633,012	
IR&D Labor - Schedule H	14,287		14,287	*
B&P Labor - Schedule H	9,525		9,525	*
Total Labor	$656,824		$656,824	
Overhead Pool: - Schedule B	$543,524	(32,912)	$510,612	
Overhead Rate	82.75%		77.74%	
General & Administrative Expense Rate (G&A)				
G&A Base				
Contract direct costs - Schedule H				
Labor			$633,012	
Travel			34,563	
Material			842,981	
Other direct costs			172,105	
Subcontracts			944,841	
Total direct costs			$2,627,502	
Overhead - Schedule B			$543,524	**
Less: IR&D/B&P Overhead transferred to G&A:				
IR&D Overhead @ General Ledger Rate 82.75% X 14,287			(11,822)	***
B&P Overhead @ General Ledger Rate 82.75% X 9,525			(7,882)	***
Total Cost Input			$3,151,322	****
G&A Pool				
Total Claimed G&A Expenses - Schedule A			$ 270,457	****
G&A Rate			8.58%	

G&A Rate

Explanatory Comments.

* The IR&D and B&P labor is included in the overhead base in order to allocate a proportionate share of overhead to the labor as required by FAR 31.2. The IR&D/B&P labor and the associated overhead is normally claimed as a part of the G&A expense.

** The claimed G&A base must include both the Schedule B claimed overhead ($510,612) plus overhead costs incurred but not claimed ($32,912).

*** Overhead on the IR&D/B&P labor at the 82.75% rate is added to the G&A pool (Schedule A) and deducted from the G&A base.

**** In summary, the total cost input base consists of contract direct costs plus overhead (claimed and unclaimed) less overhead on IR&D/B&P transferred to the G&A pool. The base does not include IR&D/B&P direct labor or other IR&D/B&P direct costs which are recovered through the G&A pool.

Insert Page 9 (Title as below)

From the ADD-INS.PDF file.

Facilities Capital Cost of Money Factors Computation

Reconciliation of Books of Account and Claimed Direct Costs
Fiscal Year Ended 3/31/90

Description	Amounts per General Ledger	Adjustments	Amount Claimed	Notes
DIRECT COSTS				
Direct Labor	$ 656,824	$	$ 656,824	
Travel	35,173	(1,687)	33,486	(1)
Material	843,192		843,192	
Other Direct Cost	187,493	(3,183)	184,310	(2)
Subcontracts	944,841		944,841	
Total Direct Cost	$ 2,667,523	$ (4,870)	$2,662,653	
	(Schedule H)			

Notes Explaining Adjustments :

(1) Travel - Costs of first class airfare in excess of coach on contract N00039-88-C-0873.

(2) ODGS - Overtime premium not allowable by terms of contract N00039-88-C-0873.

* Includes IR&D/B&P direct costs.

RECONCILIATION OF TOTAL PAYROLL TO TOTAL LABOR DISTRIBUTED FISCAL YEAR ENDED 3/31/90

Account	Expenses Per General Ledger
Direct Labor	$656,824
G&A Wages	90,007
G&A Holiday Wages	2,322
G&A Vacation Wages	5,812
G&A Sick Leave	987
G&A Personal Absence	1,082
Overhead Wages	33,060
Overhead Holiday Wages	20,181
Overhead Vacation	25,440
Overhead Sick Leave	14,318
Occupancy Wages	23,280
Overtime Premium (Included in ODC's)	270
TOTAL DISTRIBUTION	$873,583
1st Quarter	$220,375
2nd Quarter	220,132
3rd Quarter	229,101
4th Quarter	212,061
+ Prior Year Accrual	15,128
- Current Year Accrual	23,214
TOTAL	$873,583

DOE F 4600.1 (3-85)

U.S. DEPARTMENT OF ENERGY

NOTICE OF FINANCIAL ASSISTANCE AWARD

Under the authority of Public Law 95-91, U.S. Department of Energy Organization Act_____and subject to legislation, regulations and policies applicable to (cite legislative program title):

1. PROJECT TITLE XXX	2. INSTRUMENT TYPE _ GRANT X COOPERATIVE AGREEMENT
3. RECIPIENT (Name, address, zip code, area code and telephone No.) XXX	4. INSTRUMENT NO. DE-FC02-98EEXXXXX 5. AMENDMENT NO. A000
	6. BUDGET PERIOD FROM: XX/XX/XX THRU: XX/XX/XX 7. PROJECT PERIOD FROM: XX/XX/XX THRU: XX/XX/XX
8. RECIPIENT PROJECT DIRECTOR (Name and telephone No.) XXX	10. TYPE OF AWARD X NEW _ CONTINUATION _ RENEWAL _ REVISION _ SUPPLEMENT _ OTHER
9. RECIPIENT BUSINESS OFFICER (Name and telephone No.) XXX	12. ADMINISTERED FOR DOE BY (Name, address, zip code, telephone No.) XXX U.S. Department of Energy 9800 South Cass Avenue Argonne, Illinois 60439 (630) 252-
11. DOE PROJECT OFFICER (Name, address, zip code, telephone No.) XXX U.S. Department of Energy	

13. RECIPIENT TYPE

_ STATE GOV'T _ INDIAN TRIBAL GOV'T _ HOSPITAL _ FOR PROFIT ORGANIZATION _ INDIVIDUAL _ OTHER (Specify)

_ LOCAL GOV'T _ INSTITUTION OF HIGHER EDUCATION _ OTHER NONPROFIT ORGANIZATION _ C _ P _ SP _____

14. ACCOUNTING AND APPROPRIATIONS DATA

15. EMPLOYER I.D. NUMBER/SSN
XXX

a. Appropriation Symbol	b. B&R Number	c. FT/AFP/OC	d. CFA Number
XXX	XXX	XXX	N/A

16. BUDGET AND FUNDING INFORMATION

a. Current Budget Period Information		b. Cumulative DOE Obligations	
(1) DOE Funds Obligated This Action	$ XXX	(1) This Budget Period [Total of lines a.(1) and a.(3)]	$ XXX
(2) DOE Funds Authorized for Carry Over	$		
(3) DOE Funds Previously Obligated in This Budget Period	$	(2) Prior Budget Periods	$ XXX
(4) DOE Share of Total Approved Budget	$ XXX		
(5) Recipient Share of Total Approved Budget	$ XXX	(3) Project Period to Date [Total of lines b.(1) and b.(2)	$ XXX
(6) Total Approved Budget	$ XXX		

17. TOTAL ESTIMATED COST OF PROJECT

$ N/A

(This is the current estimated cost of the project. It is not a promise to award nor an authorization to expend funds in this amount.)

18. AWARD/AGREEMENT TERMS AND CONDITIONS

This award/agreement consists of this form plus the following:

a. Special terms and conditions (if grant) or schedule, general provisions, special provisions (if cooperative agreement)

b. Applicable program regulations (specify) XXX (Date) XXX

c. DOE Assistance Regulations, 10 CFR Part 600, as amended, Subparts A and X B (Grants and Cooperative Agreements).

d. Application/proposal dated XXX, __ as submitted __ with changes as negotiated

19. REMARKS

See attached Page No. 2 of this Notice of Financial Assistance Award.

20. EVIDENCE OF RECIPIENT ACCEPTANCE	21. AWARDED BY
(Signature of Authorized Recipient Official) (Date)	(Signature) (Date)
(Name)	(Name)
(Title)	(Title)

XXX - To be finalized at time of award.

19. REMARKS (Continued)

a. The following terms and conditions, attached hereto, are made a part hereof:

(1) Budget Page - DOE F 4620.1;

(2) Statement of Work;

(3) Special Terms and Conditions for Research Financial Assistance Awards, coded SPRG-0498/APM;

(4) Additional Special Provisions;

(5) Intellectual Property Provisions - Assistance (XXX); and

(6) Federal Assistance Reporting Checklist, dated XXX.

b. All references to the terms “grant(s)” or “contract(s)” shall be read as “cooperative agreement” or “agreement”; the terms “grantee” or “contractor” shall be read as “participant, recipient or awardee”; the term “subgrant” shall be read as “subaward”; and the terms “subcontract” or “contract” awarded under a grant shall be read as “contract” under a cooperative agreement.

BUDGET PAGE

XXX

SCOPE OF WORK

XXX

Special Terms and Conditions for Financial Assistance Awards

The requirements of this attachment take precedence over all other requirements of this award found in regulations, the general terms and conditions, DOE orders, etc., except requirements of statutory law. Any apparent contradiction of statutory law stated herein should be presumed to be in error until recipient has sought and received clarification from the Contracting Officer.

1. PAYMENT OFFICE

CR-54/CHO
Account Payable Division
U. S. Department of Energy
P.O. Box 500
Germantown, MD 20874-0500

2. FINANCE OFFICE

U. S. Department of Energy
Chicago Operations Office
Financial Services Group
9800 South Cass Avenue
Argonne, Illinois 60439

3. PAYMENT - Advance Payment under this award will be made by:

☐ Department of Health & Human Services (DHHS) Payment Management System (PMS), formerly DOE Letter of Credit.

The recipient shall request cash only as needed for immediate disbursements, shall report cash disbursements in a timely manner, and shall impose the same standards of timing and amount, including reporting requirements, on secondary recipients.

☐ Treasury Check

An original Request for Advance or Reimbursement, SF 270, shall be submitted as necessary to the Payment Office specified in Section 1. above, and one copy of the SF 270 shall be submitted to the Contract Specialist specified in Block 12 of the Notice of Financial Assistance Award (DOE F 4600.1). The timing and amount of advances shall be as close as is administratively feasible to the actual disbursements. Such requests shall not be made in excess of reasonable estimates of cash outlays for a 30 day period.

SPRG-0498/APM

An electronic funds transfer will be accomplished if the Finance Office has an Automated Clearing House (ACH) Vendor Miscellaneous Payment Enrollment Form on file for your organization.

4. DECONTAMINATION AND/OR DECOMMISSIONING D&D COSTS

Notwithstanding any other provisions of this Agreement, including but not limited to FAR 31.205-31, when applicable, as incorporated by Financial Assistance Rule 600.127(a), the Government shall not be responsible for or have any obligation to the recipient for (i) Decontamination and/or Decommissioning (D&D) of any of the Recipient's facilities, or (ii) any costs which may be incurred by the Recipient in connection with the D&D of any of its facilities due to the performance of the work under this Agreement, whether said work was performed prior to or subsequent to the effective date of this Agreement.

5. FEDERALLY-OWNED PROPERTY

If you acquire federally-owned property under this award whether fabricated, furnished or purchased with Capital Equipment Funds, then a listing of such property shall be submitted on DOE F 4300.3, Summary Report of DOE-Owned Plant & Capital Equipment, to the Contracting Officer within 30 days after February 28 of each year and within 30 days after the project period ends. The report must separately identify items which were fabricated, furnished, or purchased with Capital Equipment funds under this award.

6. PURCHASE OF AMERICAN-MADE EQUIPMENT AND PRODUCTS - SENSE OF CONGRESS - FISCAL YEAR 1998

It is the sense of the Congress that, to the greatest extent practicable, all equipment and products purchased with funds made available under this award should be American-made.

7. NOTICE REGARDING UNALLOWABLE COSTS AND LOBBYING ACTIVITIES

Recipients of financial assistance are cautioned to carefully review the allowable cost and other provisions applicable to expenditures under their particular award instruments. If financial assistance funds are spent for purposes or in amounts inconsistent with the allowable cost or any other provisions governing expenditures in an award instrument, the government may pursue a number of remedies against the recipient, including in appropriate circumstances, recovery of such funds, termination of the award, suspension or debarment of the recipient from future awards, and criminal prosecution for false statements.

Particular care should be taken by the recipient to comply with the provisions prohibiting the expenditure of funds for lobbying and related activities. Financial assistance a wards

may be used to describe and promote the understanding of scientific and technical aspects of specific energy technologies, but not to encourage or support political activities such as the collection and dissemination of information related to potential, planned or pending legislation.

8. ADDITIONAL PROVISIONS

If the appropriation symbol contained in Block 14.a. of the Notice of Financial Assistance Award for this award is listed below, paragraph 8.a. is applicable to this award, otherwise paragraph 8.b. applies:

89X0213.91	8990216.91	89M0216.91	89M0217.91	89X9219.91
89X0215.91	8900216.91	89X0216.91	89X0218.91	89M0219.91
89X0214.91	8910216.91	8990217.91	89M0218.91	89X0235.91

a. Department of Interior Appropriations Act Funding:

1. Lobbying Restriction

The contractor or awardee agrees that none of the funds obligated on this award shall be made available for any activity or the publication or distribution of literature that in any way tends to promote public support or opposition to any legislative proposal on which Congressional action is not complete. This restriction is in addition to those prescribed elsewhere in statute and regulation.

2. Compliance With Buy American Act

In accepting this award, the recipient agrees to comply with sections 2 through 4 of the Act of March 3, 1933 (41 U.S.C. 10a-10c, popularly known as the "Buy American Act"). The recipient should review the provisions of the Act to ensure that expenditures made under this award are in accordance with it.

b. Energy & Water Development Appropriations Act Funding:

Lobbying Restriction

The contractor or awardee agrees that none of the funds obligated on this award shall be expended, directly or indirectly, to influence congressional

action on any legislation or appropriation matters pending before Congress, other than to communicate to Members of Congress as described in 18 U.S.C. 1913. This restriction is in addition to those prescribed elsewhere in statute and regulation.

9. REPORTING

Failure to comply with the reporting requirements contained in this award will be considered a material noncompliance with the terms of the award. Noncompliance may result in a withholding of future payments, suspension or termination of the current award, and withholding of future awards. A willful failure to perform, a history of failure to perform. or of unsatisfactory performance of this and/or other financial assistance awards, may also result in a debarment action to preclude future awards by Federal agencies.

APPENDIX Q

ADDITIONAL SPECIAL PROVISIONS

TABLE OF CONTENTS

APPENDIX Q

ADDITIONAL SPECIAL PROVISIONS

1. COST SHARE CONTRIBUTIONS

It is the intention of the Government and the Participant to share the allowable and allocable costs of performance of the work during this Agreement as set forth herein.

The Government's contribution and support for this Agreement during the project period XXX through XXX will be $ XXX .00. The Participant will contribute $ XXX .00 toward the aforementioned budget period. It is the intention of the Government and the Participant to share the allowable and allocable costs of performance during the project period on a XX.X percent (Government) and XX.X percent (Participant) basis. It is understood by the parties that the DOE share of this budget period is $ XXX .00 and no additional Federal funding will be provided notwithstanding the total cost of the project at completion.

In the event the project is terminated early or not funded to its completion, the Participant will be held liable to DOE for the minimum cost share requirements under the Energy Policy Act (EPAct) (20% for research and development; 50% for demonstration or commercial application) for the effort performed as of the date of termination.

2. FEE

No fee or profit may be paid to a recipient or subrecipient for performance under this Award or subaward.

3. STATEMENT OF SUBSTANTIAL INVOLVEMENT (Example)

The Department of Energy (Department, DOE) will be substantially involved in all Tasks of the Scope of Work. The Department will collaborate with the Participant in evaluating, accepting, and achieving the milestones for research as proposed by the respondent.

The Department will provide technical direction to the overall program, as well as the individual program elements as it is determined to be necessary and appropriate by DOE. The Department will participate during the full duration of the project, and will have continuing rights to conduct ongoing negotiations with the Participant regarding the technical direction of the work conducted under this Agreement. The Department staff members will attend meetings and participate in the formation and direction of the scope of the key development activities. The DOE Project Officer will participate in the development, review and approval of all proposed statements of work, including subcontractor statements of work, prior to the execution of any subcontract. The Department will review technical progress reports and provide input to these reports as deemed necessary. In addition, the Department will have the right to have National Laboratories or selected private organizations perform independent tests and evaluations of the cooperative agreement's deliverables, thus providing an additional measure of technical progress.

The Department may collaborate with the participant in the allocation of funds budgeted for this Agreement. Further, as work progresses, funding needs may change and depending upon availability of funds, the Department may collaborate with the Participant to reallocate funds budgeted between the different programs and projects.

The Department will thus be actively monitoring all phases of the Participants' research and development activities, including participation in the Participant's reviews of its contractor's activities and review of the contractor's reports to the Participant. The Department will actively participate in the Participant's process of reviewing and approving each phase of the proposed programs and projects.

The substantial involvement by the Department under this Agreement will remain in effect for the term of the cooperative agreement award unless otherwise amended in writing by the Contracting Officer. Moreover, this statement of substantial involvement by the Department does not increase the Department of Energy's liability under the Agreement award.

4. TECHNICAL DIRECTION

A. The work to be performed by the Participant under this Cooperative Agreement is subject to the surveillance and written Technical Direction of a "DOE Project Officer," identified in block 11 of the face page. The term "Technical Direction" is defined to include, without limitation, the following:

1. Directions to the Participant which redirects the work effort, shift work emphasis between work areas or tasks, require pursuit of certain lines of inquiry, fill in details or otherwise provide technical guidance to the Participant in order to accomplish the tasks and requirements stated in the Statement of Work as contained in the agreement.

2. Provision of information to the Participant which assists in the interpretation of drawings, specifications or technical portions of the Statement of Work as contained in the Agreement.

3. Review and, where required by the Cooperative Agreement, approval of technical reports, drawings, specifications or technical information to be delivered by the Participant to DOE under the Cooperative Agreement.

4. The DOE Project Officer shall monitor the Participant's performan ce with respect to compliance with the requirements of this Cooperative Agreement.

B. Technical direction and management surveillance shall not impose tasks or requirements upon the Participant additional to or different from the tasks and requirements stated in the Statement of Work of this Agreement. The Technical Direction to be valid:

1. Must be issued in writing consistent with the tasks and requirements stated in the Statement of Work of this Agreement; and

2. May not:

a. constitute an assignment of additional work outside the tasks and requirements stated in the Statement of Work of this Agreement;

b. in any manner cause an increase or decrease in the total estimated project cost or the time required for project performance;

c. change any of the expressed terms, conditions or specification of the Cooperative Agreement; or

d. accept non-conforming work.

C. The Participant shall proceed promptly with the performance of Technical Directions duly issued by the DOE Project Officer in the manner prescribed by paragraph B. above and which are within his authority under the provisions of paragraph 1. above; provided, however, that the Participant shall immediately cease the performance of any Technical Direction upon receipt of a written instruction to that effect from the Contracting Officer.

D. If in the opinion of the Participant any Technical Direction issued by the DOE Project Officer is within one of the categories as defined in B.2. a. through d. above, the Participant shall not proceed but shall notify the Contracting Officer in writing within five working days after the receipt of any such Technical Direction and shall request the Contracting Officer to rescind such direction or mutually agree to modify the agreement accordingly.

E. The only persons authorized to give Technical Direction to the Participant under this Agreement are the Contracting Officer and any "DOE Project Officer" as listed in Block 11 of the face page. Any action taken by the Participant in response to any direction given by any person other than the Contracting Officer or DOE Project Officer shall not be binding upon the Government.

5. CONTINUATION OF WORK

There will be an evaluation of the progress near the end of each year of the work to determine to either continue, redirect, or terminate the project.

6. RESTRICTION ON TRANSFER OF FUEL CELL TECHNOLOGY TO FOREIGN ENTITIES

It is agreed that the Participant shall obtain adequate recognition of the United States support for the technology developed under this Program in any contracts, assistance, licenses, or other agreements which involve the transfer to foreign entities of the fuel cell technology developed in whole or in part at Government expense. The Participant agrees to notify DOE, as represented by DOE Patent Counsel, in writing, of the adequate recognition obtained prior to entering into any such contracts, assistance, licenses, or other agreements. The Participant shall not enter into any such contracts, assistance, licenses, or other agreements without the concurrence of DOE, as represented by DOE Patent Counsel. The determination of whether to grant such concurrence shall be at the sole discretion of DOE and is not subject to the Disputes or Appeals (at 10 CFR 600.22) or otherwise subject to litigation under the Contract Disputes Act of 1978 (41 U.S.C. 601 et seq.). The determination shall be in writing and shall be furnished to the Participant by the Contracting Officer. Examples of such an adequate recognition could include: (1) a commitment to manufacture in the U.S.A.; (2) a requirement to reimburse the U.S. Government for its R&D costs; and/or (3) a commitment to jointly sponsor the R&D program.

Intellectual Property Provisions
Research, Development, or Demonstration
Large Business, State and Local Governments, and Foreign Organizations

01. FAR 52.227-1 Authorization and Consent (JUL 1995), Alternate I

02. FAR 52.227-2 Notice and Assistance Regarding Patent and Copyright Infringement (AUG 1996)
This clause is not applicable if the award is for less than $100,000.

03. FAR 52.227-14 Rights in Data - General, as modified by DEAR 927.409 (Effective Apr 1998)
If this award requires the use or delivery of limited rights data and/or restricted computer software, Alternates II and III are incorporated , unless modified upon recommendation of Patent Counsel.

04. FAR 52.227-16 Additional Data Requirements (JUN 1987)

05. FAR 52.227-23 Rights to Proposal Data (Technical) (JUN 1987)

06. DEAR 952.227-9 Refund of Royalties (MAR 1995)

07. DEAR 952.227-13 Patent Rights ↳ Acquisition by the Government (MAR 1995)

Attachment 1 (for reference only): Patent Rights ↳ Retention by Contractor (Short Form) (MAR 1995); DEAR 952.227-11

APPENDIX Q

01. FAR 52.227-1 Authorization and Consent; Alternate I

AUTHORIZATION AND CONSENT (JUL 1995)

(a) The Government authorizes and consents to all use and manufacture of any invention described in and covered by a United States patent in the performance of this contract or any subcontract at any tier.

(b) The Contractor agrees to include, and require inclusion of, this clause, suitably modified to identify the parties, in all subcontracts at any tier for supplies or services (including construction, architect-engineer services, and materials, supplies, models, samples, and design or testing services expected to exceed the simplified acquisition threshold); however, omission of this clause from any subcontract, including those at or below the simplified acquisition threshold, does not affect this authorization and consent.

(End of clause)

02. FAR 52.227-2 Notice and Assistance Regarding Patent and Copyright Infringement

NOTICE AND ASSISTANCE REGARDING PATENT AND COPYRIGHT INFRINGEMENT (AUG 1996)

(a) The Contractor shall report to the Contracting Officer, promptly and in reasonable written detail, each notice or claim of patent or copyright infringement based on the performance of this contract of which the Contractor has knowledge.

(b) In the event of any claim or suit against the Government on account of any alleged patent or copyright infringement arising out of the performance of this contract or out of the use of any supplies furnished or work or services performed under this contract, the Contractor shall furnish to the Government, when requested by the Contracting Officer, all evidence and information in possession of the Contractor pertaining to such suit or claim. Such evidence and information shall be furnished at the expense of the Government except where the Contractor has agreed to indemnify the Government.

(c) The Contractor agrees to include, and require inclusion of, this clause in all subcontracts at any tier for supplies or services (including construction and architect-engineer subcontracts and those for material, supplies, models, samples, or design or testing services) expected to exceed the simplified acquisition threshold at FAR 2.101.

(End of clause)

03. FAR 52.227-14 Rights in Data - General, as modified by DEAR 927.409 (Effective Apr 1998)

RIGHTS IN DATA - GENERAL (JUN 1987)

(a) Definitions.

(1) *Computer data bases*, as used in this clause, means a collection of data in a form capable of, and for the purpose of, being stored in, processed, and operated on by a computer. The term does not include computer software.

(2) *Computer software*, as used in this clause, means (i) computer programs which are data comprising a series of instructions, rules, routines, or statements, regardless of the media in which recorded, that allow or cause a computer to perform a specific operation or series of operations and (ii) data comprising source code listings, design details, algorithms, processes, flow charts, formulae, and related material that would enable the computer program to be produced, created, or compiled. The term does not include computer data bases.

(3) *Data*, as used in this clause, means recorded information, regardless of form or the media on which it may be recorded. The term includes technical data and computer software. For the purposes of this clause, the term does not include data incidental to the administration of this contract, such as financial, administrative, cost and pricing, or management information.

(4) *Form, fit, and function data*, as used in this clause, means data relating to items, components, or processes that are sufficient to enable physical and functional interchangeability, as well as data identifying source, size, configuration, mating, and attachment characteristics, functional characteristics, and performance

requirements; except that for computer software it means data identifying source, functional characteristics, and performance requirements but specifically excludes the source code, algorithm, process, formulae, and flow charts of the software.

(5) *Limited rights data*, as used in this clause, means data, other than computer software, developed at private expense that embody trade secrets or are commercial or financial and confidential or privileged. The Government's rights to use, duplicate, or disclose limited rights data are as set forth in the Limited Rights Notice of subparagraph (g)(2) of this section if included in this clause.

(6) *Restricted computer software*, as used in this clause, means computer software developed at private expense and that is a trade secret; is commercial or financial and is confidential or privileged; or is published copyrighted computer software, including minor modifications of any such computer software. The Government's rights to use, duplicate, or disclose restricted computer software are as set forth in the Restricted Rights Notice of subparagraph (g)(3) of this section if included in this clause.

(7) *Technical data*, as used in this clause, means recorded data, regardless of form or characteristic, that are of a scientific or technical nature. Technical data does not include computer software, but does include manuals and instructional materials and technical data formatted as a computer data base.

(8) *Unlimited rights*, as used in this clause, means the rights of the Government to use, disclose, reproduce, prepare derivative works, distribute copies to the public, including by electronic means, and perform publicly and display publicly, in any manner, including by electronic means, and for any purpose whatsoever, and to have or permit others to do so.

(b) Allocation of rights.

(1) Except as provided in paragraph (c) below regarding copyright, the Government shall have unlimited rights in:

(i) Data first produced in the performance of this contract;

(ii) Form, fit, and function data delivered under this contract;

(iii) Data delivered under this contract (except for restricted computer software) that constitute manuals or instructional and training material for installation, operation, or routine maintenance and repair items, components, or processes delivered or furnished for use under this contract; and

(iv) All other data delivered under this contract unless provided otherwise for limited rights data or restricted computer software in accordance with paragraph (g) below.

(2) The Contractor shall have the right to:

(i) Use, release to others, reproduce, distribute, or publish any data first produced or specifically used by the Contractor in the performance of this contract, unless provided otherwise in paragraph (d) below;

(ii) Protect from unauthorized disclosure and use those data which are limited rights data or restricted computer software to the extent provided in paragraph (g) below;

(iii) Substantiate use of, add or correct limited rights, restricted rights, or copyright notices and to take other appropriate action, in accordance with paragraphs (e) and (f) below; and

(iv) Establish claim to copyright subsisting in data first produced in the performance of this contract to the extent provided in subparagraph (c)(1) below.

(c) Copyright.

(1) Data first produced in the performance of this contract. Unless provided otherwise in subparagraph (d) below, the Contractor may establish, without prior approval of the Contracting Officer, claim to copyright subsisting in scientific and technical articles based on or containing data first produced in the performance of this contract and published in academic, technical or professional journals, symposia proceedings or similar works. The prior, express written permission of the Contracting Officer is required to establish claim to copyright subsisting in all other data first produced in the performance of this contract. When claim to copyright is made, the Contractor shall affix the applicable copyright notices of 17 U.S.C. 401 or 402 and acknowledgment of Government sponsorship (including contract number) to the data when such data are delivered to the Government, as well as when the data are published or deposited for registration as a published work in the U.S. Copyright Office. For data other than computer software the Contractor grants to the Government, and others acting on its behalf, a paid-up, nonexclusive, irrevocable worldwide license in such copyrighted data to reproduce, prepare derivative works, distribute copies to the public, and perform publicly and display publicly, by or on behalf of the Government. For computer software, the Contractor grants to the Government and others acting in its behalf, a paid-up nonexclusive, irrevocable worldwide license in such copyrighted computer software to reproduce, prepare derivative works, and perform publicly and display publicly by or on behalf of the Government.

(2) Data not first produced in the performance of this contract. The Contractor shall not, without prior written permission of the Contracting Officer, incorporate in data delivered under this contract any data not first produced in the performance of this contract and which contains the copyright notice of 17 U.S.C. 401 and 402, unless the Contractor identifies such data and grants to the Government, or acquires on its behalf, a license of the same scope as set forth in subparagraph (1) above; provided, however, that if such data are computer software the Government shall acquire a copyright license as set forth in subparagraph (g)(3) below if included in this contract or as otherwise may be provided in a collateral agreement incorporated in or made part of this contract.

(3) Removal of copyright notices. The Government agrees not to remove any copyright notices place on data pursuant to this paragraph (c), and to include such notices on all reproductions of the data.

(d) Release, publication and use of data.

(1) The Contractor shall have the right to use, release to others, reproduce, distribute, or publish any data first produced or specifically used by the Contractor in the performance of this contract, except to the extent such data may be subject to the Federal export control or national security laws or regulations, or unless otherwise provided below in this paragraph or expressly set forth in this contract.

(2) The Contractor agrees that to the extent it receives or is given access to data necessary for the performance of this contract which contain restrictive markings, the Contractor shall treat the data in accordance with such markings unless otherwise specifically authorized in writing by the Contracting Officer.

(3) The Contractor agrees not to assert copyright in computer software first produced in the performance of this contract without prior written permission of the DOE Patent Counsel assisting the contracting activity. When such permission is granted, the Patent Counsel shall specify appropriate terms, conditions, and submission requirements to assure utilization, dissemination, and commercialization of the data. The Contractor, when requested, shall promptly deliver to Patent Counsel a duly executed and approved instrument fully confirmatory of all rights to which the Government is entitled.

(e) Unauthorized marking of data.

(1) Notwithstanding any other provisions of this contract concerning inspection or acceptance, if any data delivered under this contract are marked with the notices specified in subparagraphs (g)(2) or (g)(3) below and use of such is not authorized by this clause, or if such data bears any other restrictive or limiting markings not authorized by this contract, the Contracting Officer may at any time either return the data to the Contractor, or cancel or ignore the markings. However, the following procedures shall apply prior to canceling or ignoring the markings.

(i) The Contracting Officer shall make written inquiry to the contractor affording the Contractor 30 days from receipt of the inquiry to provide written justification to substantiate the propriety of the markings;

(ii) If the Contractor fails to respond or fails to provide written justification to substantiate the propriety of the markings within the 30-day period (or a longer time not exceeding 90 days approved in writing by the Contracting Officer for good cause shown), the Government shall have the right to cancel or ignore the markings at any time after said period and the data will not longer be made subject to any disclosure prohibitions.

(iii) If the Contractor provides written justification to substantiate the propriety of the markings within the period set in subdivision (i) above, the Contracting Officer shall consider such written justification and determine whether or not the markings are to be canceled or ignore. If the Contracting Officer determines that the markings are authorized, the Contractor shall be so notified in writing. If the Contracting Officer determines, with concurrence of the Head of the Contracting Activity, that the markings are not authorized, the Contracting Officer shall furnish the Contractor a written determination, which determination shall become the final agency decision regarding the appropriateness of the markings unless the Contractor files suit in a court of competent jurisdiction within 90 days of receipt of the Contracting Officer's decision. The Government shall continue to abide by the markings under this subdivision (iii) until final resolution of the matter either by the Contracting Officer's determination becoming final (in which instance the Government shall thereafter have the right to cancel or ignore the markings at any time and the data will no longer be made subject to any disclosure prohibitions), or by final disposition of the matter by court decision if suit is filed.

(2) The time limits in the procedures set forth in subparagraph (1) above may be modified in accordance with agency regulations implementing the Freedom of Information Act (5 U.S.C. 552) if necessary to respond to a request thereunder.

(3) This paragraph (e) does not apply if this contract is for a major system or for support of a major system by a civilian agency other than NASA and the U.S. Coast Guard subject to the provisions of Title III of the Federal Property and Administrative Services Act of 1949.

(4) Except to the extent the Government's action occurs as the result of final disposition of the matter by a court of competent jurisdiction, the Contractor is not precluded by this paragraph (e) from bringing a claim under the Contract Disputes Act, including pursuant to the Disputes clause of this contract, as applicable, that may arise as the result of the Government removing or ignoring authorized markings on data delivered under this contract.

(f) Omitted or incorrect markings.

(1) Data delivered to the Government without either the limited rights or restricted rights notice as authorized by paragraph (g) below, or the copyright notice required by paragraph (c) above, shall be deemed to have been furnished with unlimited rights, and the Government assumes no liability for disclosure, use, or reproduction of such data. However, to the extent the data has not been disclosed without restriction outside the Government, the Contractor may request, within 6 months (or a longer time approved by the Contracting Officer for good cause shown) after delivery of such data, permission to have notices placed on qualifying data at the Contractor's expense, and the Contracting Officer may agree to do so if the Contractor:

(i) Identifies the data to which the omitted notice is to be applied;

(ii) Demonstrates that the omission of the notice was inadvertent;

(iii) Establishes that the use of the proposed notice is authorized; and

(iv) Acknowledges that the Government has no liability with respect to the disclosure, use, or reproduction of any such data made prior to the addition of the notice or resulting from the omission of the notice.

(2) The Contracting Officer may also (i) permit correction at the Contractor's expense of incorrect notices if the Contractor identifies the data on which correction of the notice is to be made, and demonstrates that the correct notice is authorized, or (ii) correct any incorrect notices.

(g) Protection of limited rights data and restricted computer software.

(1) When data other than that listed in subparagraphs (b)(1)(i), (ii), and (iii) above are specified to be delivered under this contract and qualify as either limited rights data or restricted computer software, if the Contractor desires to continue protection of such data, the Contractor shall withhold such data and not furnish them to the Government under this Contract. As a condition to this withholding, the Contractor shall identify the data being withheld and furnish form, fit, and function data in lieu thereof. Limited rights data that are formatted as a computer data base for delivery to the Government is to be treated as limited rights data and not restricted computer software.

(2) [Reserved.]

(3) [Reserved.]

(h) Subcontracting.

The Contractor has the responsibility to obtain from its subcontractors all data and rights therein necessary to fulfill the Contractor's obligations to the Government under this contract. If a subcontractor refuses to accept terms affording the Government such rights, the Contractor shall promptly bring such refusal to the attention of the Contracting Officer and not proceed with subcontract award without further authorization.

(i) Relationship to patents.

Nothing contained in this clause shall imply a license to the Government under any patent or be construed as affecting the scope of any license or other right otherwise granted to the Government.

(j) The Contractor agrees, except as may be otherwise specified in this contract for specific data items listed as not subject to this paragraph, that the Contracting Officer or an authorized representative may, up to three years after acceptance of all items to be delivered under this contract, inspect at the Contractor's facility any data withheld pursuant to paragraph (g)(1) above, for purposes of verifying the Contractor's assertion pertaining to the limited rights or restricted rights status of the data or for evaluating work performance. Where the Contractor whose data are to be inspected demonstrates to the Contracting Officer that there would be a possible conflict of interest if the inspection where made by a particular representative, the Contracting Officer shall designate an alternate inspector.

(End of clause)

***Alternate II* (Jun 1987)**

(g)(2) Notwithstanding subparagraph (g)(1) of this clause, the contract may identify and specify the delivery of limited rights data, or the Contracting Officer may require by written request the delivery of limited rights data that has been withheld or would otherwise be withholdable. If delivery of such data is so required, the Contractor may affix the following "Limited Rights Notice" to the data and the Government will thereafter treat the data, subject to the provisions of paragraphs (e) and (f) of this clause, in accordance with such Notice:

LIMITED RIGHTS NOTICE (JUN 1987)

(a) These data are submitted with limited rights under Government contract No. _____ (and subcontract No. _____, if appropriate). These data may be reproduced and used by the Government with the express limitation that they will not, without written permission of the Contractor, be used for purposes of manufacture nor disclosed outside the Government; except that the Government may disclose these data outside the Government for the following purposes, if any, provided that the Government makes such disclosure subject to prohibition against further use and disclosure:

-[Agencies may list additional purposes as set forth in 27.404(d)(1) or if none, so state]

(b) This Notice shall be marked on any reproduction of these data, in whole or in part.

(End of notice)

***Alternate III* (Jun 1987)**

(g)(3)(i) Notwithstanding subparagraph (g)(1) of this clause, the contract may identify and specify the delivery of restricted computer software, or the Contracting Officer may require by written request the delivery of restricted computer software that has been withheld or would otherwise be withholdable. If delivery of such computer software is so required, the Contractor may affix the following "Restricted Rights Notice" to the computer software and the Government will thereafter treat the computer software, subject to paragraphs (e) and (f) of this clause, in accordance with the Notice:

RESTRICTED RIGHTS NOTICE (JUN 1987)

(a) This computer software is submitted with restricted rights under Government Contract No. _____ (and subcontract _____, if appropriate). It may not be used, reproduced, or disclosed by the Government except as provided in paragraph (b) of this Notice or as otherwise expressly stated in the contract.

(b) This computer software may be:

(1) Used or copied for use in or with the computer or computers for which it was acquired, including use at any Government installation to which such computer or computers may be transferred;

(2) Used or copied for use in a backup computer if any computer for which it was acquired is inoperative;

(3) Reproduced for safekeeping (archives) or backup purposes;

(4) Modified, adapted, or combined with other computer software, provided that the modified, combined, or adapted portions of the derivative software incorporating restricted computer software are made subject to the same restricted rights;

(5) Disclosed to and reproduced for use by support service Contractors in accordance with subparagraphs (b)(1) through (4) of this clause, provided the Government makes such disclosure or reproduction subject to these restricted rights; and

(6) Used or copied for use in or transferred to a replacement computer.

(c) Notwithstanding the foregoing, if this computer software is published copyrighted computer software, it is licensed to the Government, without disclosure prohibitions, with the minimum rights set forth in paragraph (b) of this clause.

(d) Any others rights or limitations regarding the use, duplication, or disclosure of this computer software are to be expressly stated in, or incorporated in, the contract.

(e) This Notice shall be marked on any reproduction of this computer software, in whole or in part.

(End of notice)

(ii) Where it is impractical to include the Restricted Rights Notice on restricted computer software, the following short-form Notice may be used in lieu thereof:

RESTRICTED RIGHTS NOTICE SHORT FORM (JUN 1987)

Use, reproduction, or disclosure is subject to restrictions set forth in Contract No. _____ (and subcontract _____, if appropriate) with _____ (name of Contractor and subcontractor)."

(End of notice)

(iii) If restricted computer software is delivered with the copyright notice of 17 U.S.C. 401, it will be presumed to be published copyrighted computer software licensed to the Government without disclosure prohibitions, with the minimum rights set forth in paragraph (b) of this clause, unless the Contractor includes the following statement with such copyright notice: "Unpublished-rights reserved under the Copyright Laws of the United States."

04. FAR 52.227-16 Additional Data Requirements

ADDITIONAL DATA REQUIREMENTS (JUN 1987)

(a) In addition to the data (as defined in the clause at 52.227-14, Rights in Data-General clause or other equivalent included in this contract) specified elsewhere in this contract to be delivered, the Contracting Officer may, at any time during contract performance or within a period of 3 years after acceptance of all items to be delivered under this contract, order any data first produced or specifically used in the performance of this contract.

(b) The Rights in Data-General clause or other equivalent included in this contract is applicable to all data ordered under this Additional Data Requirements clause. Nothing contained in this clause shall require the Contractor to deliver any data the withholding of which is authorized by the Rights in Data-General or other equivalent clause of this contract, or data which are specifically identified in this contract as not subject to this clause.

(c) When data are to be delivered under this clause, the Contractor will be compensated for converting the data into the prescribed form, for reproduction, and for delivery.

(d) The Contracting Officer may release the Contractor from the requirements of this clause for specifically identified data items at any time during the 3-year period set forth in paragraph (a) of this clause.

(End of clause)

05. FAR 52.227-23 Rights to Proposal Data

RIGHTS TO PROPOSAL DATA (TECHNICAL)(JUN 1987)

Except for data contained on pages _____, it is agreed that as a condition of award of this contract, and notwithstanding the conditions of any notice appearing thereon, the Government shall have unlimited rights (as defined in the "Rights in Data--General" clause contained in this contract) in and to the technical data contained in the proposal dated _____, upon which this contract is based.

06. DEAR 952.227-9 Refund of Royalties

REFUND OF ROYALTIES (FEB 1995)

(a) The contract price includes certain amounts for royalties payable by the Contractor or subcontractors or both, which amounts have been reported to the Contracting Officer.

(b) The term "royalties" as used in this clause refers to any costs or charges in the nature of royalties, license fees, patent or license amortization costs, or the like, for the use of or for rights in patents and patent applications in connection with performing this contract or any subcontract here-under. The term also includes any costs or charges associated with the access to, use of, or other right pertaining to data that is represented to be

proprietary and is related to the performance of this contract or the copying of such data or data that is copyrighted.

(c) The Contractor shall furnish to the Contracting Officer, before final payment under this contract, a statement of royalties paid or required to be paid in connection with performing this contract and subcontracts hereunder together with the reasons.

(d) The Contractor will be compensated for royalties reported under paragraph (c) of this clause, only to the extent that such royalties were included in the contract price and are determined by the Contracting Officer to be properly chargeable to the Government and allocable to the contract. To the extent that any royalties that are included in the contract price are not, in fact, paid by the Contractor or are determined by the Contracting Officer not to be properly chargeable to the government and allocable to the contract, the contract price shall be reduced. Repayment or credit to the Government shall be made as the Contracting Officer directs. The approval by DOE of any individual payments or royalties shall not prevent the Government from contesting at any time the enforceability, validity, scope of, or title to, any patent or the proprietary nature of data pursuant to which a royalty or other payment is to be or has been made.

(e) If, at any time within 3 years after final payment under this contract, the Contractor for any reason is relieved in whole or in part from the payment of the royalties included in the final contract price as adjusted pursuant to paragraph (d) of this clause, the Contractor shall promptly notify the Contracting Officer of that fact and shall reimburse the Government in a corresponding amount.

(f) The substance of this clause, including this paragraph (f), shall be included in any subcontract in which the amount of royalties reported during negotiation of the subcontract exceeds $250.

(End of clause)

07. DEAR 952.227-13 Patent Rights - Acquisition by the Government

PATENT RIGHTS-ACQUISITION BY THE GOVERNMENT (FEB 1995)

(a) Definitions.

"Invention", as used in this clause, means any invention or discovery which is or may be patentable or otherwise protectable under title 35 of the United States Code or any novel variety of plant that is or may be protectable under the Plant Variety Protection Act (7 U.S.C. 2321, et seq.).

"Practical application", as used in this clause, means to manufacture, in the case of a composition or product; to practice, in the case of a process or method; or to operate, in the case of a machine or system; and, in each case, under such conditions as to establish that the invention is being utilized and that its benefits are, to the extent permitted by law or Government regulations, available to the public on reasonable terms.

"Subject invention", as used in this clause, means any invention of the Contractor conceived or first actually reduced to practice in the course of or under this contract.

"Patent Counsel", as used in this clause, means the Department of Energy Patent Counsel assisting the procuring activity.

"DOE patent waiver regulations", as used in this clause, means the Department of Energy patent waiver regulations at 41 CFR 9-9.109-6 or successor regulations. See 10 CFR part 784.

"Agency licensing regulations" and "applicable agency licensing regulations", as used in this clause, mean the Department of Energy patent licensing regulations at 10 CFR Part 781.

(b) Allocations of principal rights.

(1) Assignment to the Government. The Contractor agrees to assign to the Government the entire right, title, and interest throughout the world in and to each subject invention, except to the extent that rights are retained by the Contractor under subparagraph (b)(2) and paragraph (d) of this clause.

(2) Greater rights determinations.

(i) The contractor, or an employee-inventor after consultation with the Contractor, may request greater rights than the nonexclusive license and the foreign patent rights provided in paragraph (d) of this clause on identified inventions in accordance with the DOE patent waiver regulations. A request for a determination of whether the Contractor or the employee-inventor is entitled to acquire such greater rights must be submitted to the Patent Counsel with a copy to the Contracting Officer at the time of the first disclosure of the invention pursuant to subparagraph (e)(2) of this clause, or not later than 8 months thereafter, unless a longer period is authorized in writing by the Contracting Officer for good cause shown in writing by the Contractor. Each determination of greater rights under this contract shall be subject to paragraph (c) of this clause, unless otherwise provided in the greater rights determination, and to the reservations and conditions deemed to be appropriate by the Secretary of Energy or designee.

(ii) Within two (2) months after the filing of a patent application, the Contractor shall provide the filing date, serial number and title, a copy of the patent application (including an English-language version if filed in a language other than English), and, promptly upon issuance of a patent, provide the patent number and issue date for any subject invention in any country for which the Contractor has been granted title or the right to file and prosecute on behalf of the United States by the Department of Energy.

(iii) Not less than thirty (30) days before the expiration of the response period for any action required by the Patent and Trademark Office, notify the Patent Counsel of any decision not to continue prosecution of the application.

(iv) Upon request, the Contractor shall furnish the Government an irrevocable power to inspect and make copies of the patent application file.

(c) Minimum rights acquired by the Government.

(1) With respect to each subject invention to which the Department of Energy grants the Contractor principal or exclusive rights, the Contractor agrees as follows:

(i) The Contractor hereby grants to the Government a nonexclusive, nontransferable, irrevocable, paid-up license to practice or have practiced each subject invention throughout the world by or on behalf of the Government of the United States (including any Government agency).

(ii) The Contractor agrees that with respect to any subject invention in which DOE has granted it title, DOE has the right in accordance with the procedures in the DOE patent waiver regulations (10 CFR part 784) to require the Contractor, an assignee, or exclusive licensee of a subject invention to grant a nonexclusive, partially exclusive, or exclusive license in any field of use to a responsible applicant or applicants, upon terms that are reasonable under the circumstances, and if the Contractor, assignee, or exclusive licensee refuses such a request, DOE has the right to grant such a license itself if it determines that--

(A) Such action is necessary because the Contractor or assignee has not taken, or is not expected to take within a reasonable time, effective steps to achieve practical application of the subject invention in such field of use;

(B) Such action is necessary to alleviate health or safety needs which are not reasonably satisfied by the Contractor, assignee, or their licensees;

(C) Such action is necessary to meet requirements for public use specified by Federal regulations and such requirements are not reasonably satisfied by the Contractor, assignee, or licensees; or

(D) Such action is necessary because the agreement required by paragraph (i) of this clause has neither been obtained nor waived or because a licensee of the exclusive right to use or sell any subject invention in the United States is in breach of such agreement.

(iii) The Contractor agrees to submit on request periodic reports no more frequently than annually on the utilization of a subject invention or on efforts at obtaining such utilization of a subject invention or on efforts at obtaining such utilization that are being made by the Contractor or its licensees or assignees. Such reports shall include information regarding the status of development, date of first commercial sale or use, gross royalties received by the Contractor, and such other data and information as DOE may reasonably specify. The Contractor also agrees to provide additional reports as may be requested by DOE in connection with any march-in proceedings undertaken by that agency in accordance with subparagraph (c)(1)(ii) of this clause. To the extent data or information supplied under this section is considered by the Contractor, its licensee, or assignee to be privileged and confidential and is so marked, the Department of Energy agrees that, to the extent permitted by law, it will not disclose such information to persons outside the Government.

(iv) The Contractor agrees, when licensing a subject invention, to arrange to avoid royalty charges on acquisitions involving Government funds, including funds derived through a Military Assistance Program of the Government or otherwise derived through the Government, to refund any amounts received as royalty charges on a subject invention in acquisitions for, or on behalf of, the Government, and to provide for such refund in any instrument transferring rights in the invention to any party.

(v) The Contractor agrees to provide for the Government's paid-up license pursuant to subparagraph (c)(1)(i) of this clause in any instrument transferring rights in a subject invention and to provide for the granting of licenses as required by subparagraph (c)(1)(ii) of this clause, and for the reporting of utilization information as required by subparagraph (c)(1)(iii) of this clause, whenever the instrument transfers principal or exclusive rights in a subject invention.

(2) Nothing contained in this paragraph (c) shall be deemed to grant to the Government any rights with respect to any invention other than a subject invention.

(d) Minimum rights to the Contractor.

(1) The Contractor is hereby granted a revocable, nonexclusive, royalty-free license in each patent application filed in any country on a subject invention and any resulting patent in which the Government obtains title, unless the Contractor fails to disclose the subject invention within the times specified in subparagraph (e)(2) of this clause. The Contractor's license extends to its domestic subsidiaries and affiliates, if any, within the corporate structure of which the Contractor is a part and includes the right to grant sublicenses of the same scope to the extent the Contractor was legally obligated to do so at the time the contract was awarded. The license is transferable only with the approval of DOE except when transferred to the successor of that part of the Contractor's business to which the invention pertains.

(2) The Contractor's domestic license may be revoked or modified by DOE to the extent necessary to achieve expeditious practical application of the subject invention pursuant to an application for an exclusive license submitted in accordance with applicable provisions in 37 CFR Part 404 and agency licensing regulations. This license will not be revoked in that field of use or the geographical areas in which the Contractor has achieved practical applications and continues to make the benefits of the invention reasonably accessible to the public. The license in any foreign country may be revoked or modified at the discretion of DOE to the extent the Contractor, its licensees, or its domestic subsidiaries or affiliates have failed to achieve practical application in that foreign country.

(3) Before revocation or modification of the license, DOE will furnish the Contractor a written notice of its intention to revoke or modify the license, and the Contractor will be allowed 30 days (or such other time as may be authorized by DOE for good cause shown by the Contractor) after the notice to show cause why the license should not be revoked or modified. The Contractor has the right to appeal, in accordance with applicable agency licensing regulations and 37 CFR Part 404 concerning the licensing of Government-owned inventions, any decision concerning the revocation or modification of its license.

(4) The Contractor may request the right to acquire patent rights to a subject invention in any foreign country where the Government has elected not to secure such rights, subject to the conditions in subparagraphs (d)(4)(i)

through (d)(4)(vii) of this clause. Such request must be made in writing to the Patent Counsel as part of the disclosure required by subparagraph (e)(2) of this clause, with a copy to the DOE Contracting Officer. DOE approval, if given, will be based on a determination that this would best serve the national interest.

(i) The recipient of such rights, when specifically requested by DOE, and three years after issuance of a foreign patent disclosing the subject invention, shall furnish DOE a report stating:

(A) The commercial use that is being made, or is intended to be made, of said invention, and

(B) The steps taken to bring the invention to the point of practical application or to make the invention available for licensing.

(ii) The Government shall retain at least an irrevocable, nonexclusive, paid-up license to make, use, and sell the invention throughout the world by or on behalf of the Government (including any Government agency) and States and domestic municipal governments, unless the Secretary of Energy or designee determines that it would not be in the public interest to acquire the license for the States and domestic municipal governments.

(iii) If noted elsewhere in this contract as a condition of the grant of an advance waiver of the Government's title to inventions under this contract, or, if no advance waiver was granted but a waiver of the Government's title to an identified invention is granted pursuant to subparagraph (b)(2) of this clause upon a determination by the Secretary of Energy that it is in the Government's best interest, this license shall include the right of the Government to sublicense foreign governments pursuant to any existing or future treaty or agreement with such foreign governments.

(iv) Subject to the rights granted in subparagraphs (d)(1), (2), and (3) of this clause, the Secretary of Energy or designee shall have the right to terminate the foreign patent rights granted in this subparagraph (d)(4) in whole or in part unless the recipient of such rights demonstrates to the satisfaction of the Secretary of Energy or designee that effective steps necessary to accomplish substantial utilization of the invention have been taken or within a reasonable time will be taken.

(v) Subject to the rights granted in subparagraphs (d)(1), (2), and (3) of this clause, the Secretary of Energy or designee shall have the right, commencing four years after foreign patent rights are accorded under this subparagraph (d)(4), to require the granting of a nonexclusive or partially exclusive license to a responsible applicant or applicants, upon terms reasonable under the circumstances, and in appropriate circumstances to terminate said foreign patent rights in whole or in part, following a hearing upon notice thereof to the public, upon a petition by an interested person justifying such hearing:

(A) If the Secretary of Energy or designee determines, upon review of such material as he deems relevant, and after the recipient of such rights or other interested person has had the opportunity to provide such relevant and material information as the Secretary or designee may require, that such foreign patent rights have tended substantially to lessen competition or to result in undue market concentration in any section of the United States in any line of commerce to which the technology relates; or

(B) Unless the recipient of such rights demonstrates to the satisfaction of the Secretary of Energy or designee at such hearing that the recipient has taken effective steps, or within a reasonable time thereafter is expected to take such steps, necessary to accomplish substantial utilization of the invention.

(vi) If the contractor is to file a foreign patent application on a subject invention, the Government agrees, upon written request, to use its best efforts to withhold publication of such invention disclosures for such period of time as specified by Patent Counsel, but in no event shall the Government or its employees be liable for any publication thereof.

(vii) Subject to the license specified in subparagraphs (d)(1), (2), and (3) of this clause, the contractor or inventor agrees to convey to the Government, upon request, the entire right, title, and interest in any foreign country in which the contractor or inventor fails to have a patent application filed in a timely manner or decides not to continue prosecution or to pay any maintenance fees covering the invention. To avoid forfeiture of the patent application or patent, the contractor or inventor shall, not less than 60 days before the expiration period for

any action required by any patent office, notify the Patent Counsel of such failure or decision, and deliver to the Patent Counsel, the executed instruments necessary for the conveyance specified in this paragraph.

(e) Invention identification, disclosures, and reports.

(1) The Contractor shall establish and maintain active and effective procedures to assure that subject inventions are promptly identified and disclosed o Contractor personnel responsible for patent matters within 6 months of conception and/or first actual reduction to practice, whichever occurs first in the performance of work under this contract. These procedures shall include the maintenance of laboratory notebooks or equivalent records and other records as are reasonably necessary to document the conception and/or the first actual reduction to practice of subject inventions, and records that show that the procedures for identifying and disclosing the inventions are followed. Upon request, the Contractor shall furnish the Contracting Officer a description of such procedures for evaluation and for determination as to their effectiveness.

(2) The Contractor shall disclose each subject invention to the DOE Patent Counsel with a copy to the Contracting Officer within 2 months after the inventor discloses it in writing to Contractor personnel responsible for patent matters or, if earlier, within 6 months after the Contractor becomes aware that a subject invention has been made, but in any event before any on sale, public use, or publication of such invention known to the Contractor. The disclosure to DOE shall be in the form of a written report and shall identify the contract under which the invention was made and the inventor(s). It shall be sufficiently complete in technical detail to convey a clear understanding, to the extent known at the time of the disclosure, of the nature, purpose, operation, and physical, chemical, biological, or electrical characteristics of the invention. The disclosure shall also identify any publication, on sale, or public use of the invention and whether a manuscript describing the invention has been submitted for publication and, if so, whether it has been accepted for publication at the time of disclosure. In addition, after disclosure to DOE, the Contractor shall promptly notify Patent Counsel of the acceptance of any manuscript describing the invention for publication or of any on sale or public use planned by the Contractor. The report should also include any request for a greater rights determination in accordance with subparagraph (b)(2) of this clause. When an invention is disclosed to DOE under this paragraph, it shall be deemed to have been made in the manner specified in Sections (a)(1) and (a)(2) of 42 U.S.C. 5908, unless the Contractor contends in writing at the time the invention is disclosed that is was not so made.

(3) The Contractor shall furnish the Contracting Officer the following:

(i) Interim reports every 12 months (or such longer period as may be specified by the Contracting Officer) from the date of the contract, listing subject inventions during that period, and certifying that all subject inventions have been disclosed (or that there are not such inventions) and that the procedures required by subparagraph (e)(1) of this clause have been followed.

(ii) A final report, within 3 months after completion of the contracted work listing all subject inventions or certifying that there were no such inventions, and listing all subcontracts at any tier containing a patent rights clause or certifying that there were no such subcontracts.

(4) The Contractor agrees to require, by written agreement, its employees, other than clerical and nontechnical employees, to disclose promptly in writing to personnel identified as responsible for the administration of patent matters and in a format suggested by the Contractor each subject invention made under contract in order that the Contractor can comply with the disclosure provisions of paragraph (c) of this clause, and to execute all papers necessary to file patent applications on subject inventions and to establish the Government's rights in the subject inventions. This disclosure format should require, as a minimum, the information required by subparagraph (e)(2) of this clause.

(5) The Contractor agrees, subject to FAR 27.302(j), that the Government may duplicate and disclose subject invention disclosures and all other reports and papers furnished or required to be furnished pursuant to this clause.

(f) Examination of records relating to inventions.

(1) The Contracting Officer or any authorized representative shall, until 3 years after final payment under this contract, have the right to examine any books (including laboratory notebooks), records, and documents of the

Contractor relating to the conception or first actual reduction to practice of inventions in the same field of technology as the work under this contract to determine whether--

(i) Any such inventions are subject inventions;

(ii) The Contractor has established and maintains the procedures required by subparagraphs (e)(1) and (4) of this clause;

(iii) The Contractor and its inventors have complied with the procedures.

(2) If the Contracting Officer learns of an unreported Contractor invention which the Contracting Officer believes may be a subject invention, the Contractor may be required to disclose the invention to DOE for a determination of ownership rights.

(3) Any examination of records under this paragraph will be subject to appropriate conditions to protect the confidentiality of the information involved.

(g) Withholding of payment (NOTE: This paragraph does not apply to subcontracts).

(1) Any time before final payment under this contract, the Contracting Officer may, in the Government's interest, withhold payment until a reserve not exceeding $50,000 or 5 percent of the amount of this contract, whichever is less, shall have been set aside if, in the Contracting Officer's opinion, the Contractor fails to--

(i) Convey to the Government, using a DOE-approved form, the title and/or rights of the Government in each subject invention as required by this clause.

(ii) Establish, maintain, and follow effective procedures for identifying and disclosing subject inventions pursuant to subparagraph (e)(1) of this clause;

(iii) Disclose any subject invention pursuant to subparagraph (e)(2) of this clause;

(iv) Deliver acceptable interim reports pursuant to subparagraph (e)(3)(i) of this clause; or

(v) Provide the information regarding subcontracts pursuant to subparagraph (h)(4) of this clause.

(2) Such reserve or balance shall be withheld until the Contracting Officer has determined that the Contractor has rectified whatever deficiencies exist and has delivered all reports, disclosures, and other information required by this clause.

(3) Final payment under this contract shall not be made before the Contractor delivers to the Contracting Officer all disclosures of subject inventions required by subparagraph (e)(2) of this clause, and acceptable final report pursuant to subparagraph (e)(3)(ii) of this clause, and the Patent Counsel has issued a patent clearance certification to the Contracting Officer.

(4) The Contracting Officer may decrease or increase the sums withheld up to the maximum authorized above. No amount shall be withheld under this paragraph while the amount specified by this paragraph is being withheld under other provisions of the contract. The withholding of any amount or the subsequent payment thereof shall not be construed as a waiver of any Government rights.

(h) Subcontracts.

(1) The contractor shall include the clause at 48 CFR 952.227-11 (suitably modified to identify the parties) in all subcontracts, regardless of tier, for experimental, developmental, demonstration, or research work to be performed by a small business firm or domestic nonprofit organization, except where the work of the subcontract is subject to an Exceptional Circumstances Determination by DOE. In all other subcontracts, regardless of tier, for experimental, developmental, demonstration, or research work, the contractor shall include this clause (suitably modified to identify the parties). The contractor shall not, as part of the consideration for awarding the subcontract, obtain rights in the subcontractor's subject inventions.

(2) In the event of a refusal by a prospective subcontractor to accept such a clause the Contractor--

(i) Shall promptly submit a written notice to the Contracting Officer setting forth the subcontractor's reasons for such refusal and other pertinent information that may expedite disposition of the matter; and

(ii) Shall not proceed with such subcontract without the written authorization of the Contracting Officer.

(3) In the case of subcontracts at any tier, DOE, the subcontractor, and Contractor agree that the mutual obligations of the parties created by this clause constitute a contract between the subcontractor and DOE with respect to those matters covered by this clause.

(4) The Contractor shall promptly notify the Contracting Officer in writing upon the award of any subcontract at any tier containing a patent rights clause by identifying the subcontractor, the applicable patent rights clause, the work to be performed under the subcontract, and the dates of award and estimated completion. Upon request of the Contracting Officer, the Contractor shall furnish a copy of such subcontract, and, no more frequently than annually, a listing of the subcontracts that have been awarded.

(5) The contractor shall identify all subject inventions of the subcontractor of which it acquires knowledge in the performance of this contract and shall notify the Patent Counsel, with a copy to the contracting officer, promptly upon identification of the inventions.

(i) Preference United States industry. Unless provided otherwise, no Contractor that receives title to any subject invention and no assignee of any such Contractor shall grant to any person the exclusive right to use or sell any subject invention in the United States unless such person agrees that any products embodying the subject invention will be manufactured substantially in the United States. However, in individual cases, the requirement may be waived by the Government upon a showing by the Contractor or assignee that reasonable but unsuccessful efforts have been made to grant licenses on similar terms to potential licensees that would be likely to manufacture substantially in the United States or that under the circumstances domestic manufacture is not commercially feasible.

(j) Atomic energy.

(1) No claim for pecuniary award of compensation under the provisions of the Atomic Energy Act of 1954, as amended, shall be asserted with respect to any invention or discovery made or conceived in the course of or under this contract.

(2) Except as otherwise authorized in writing by the Contracting Officer, the Contractor will obtain patent agreements to effectuate the provisions of subparagraph (e)(1) of this clause from all persons who perform any part of the work under this contract, except nontechnical personnel, such as clerical employees and manual laborers.

(k) Background Patents.

(1) Background Patent means a domestic patent covering an invention or discovery which is not a subject invention and which is owned or controlled by the Contractor at any time through the completion of this contract:

(i) Which the contractor, but not the Government, has the right to license to others without obligation to pay royalties thereon, and

(ii) Infringement of which cannot reasonably be avoided upon the practice of any specific process, method, machine, manufacture, or composition of matter (including relatively minor modifications thereof) which is a subject of the research, development, or demonstration work performed under this contract.

(2) The Contractor agrees to and does hereby grant to the Government a royalty-free, nonexclusive license under any background patent for purposes of practicing a subject of this contract by or for the Government in research, development, and demonstration work only.

(3) The Contractor also agrees that upon written application by DOE, it will grant to responsible parties, for purposes of practicing a subject of this contract, nonexclusive licenses under any background patent on terms that are reasonable under the circumstances. If, however, the Contractor believes that exclusive rights are necessary to achieve expeditious commercial development or utilization, then a request may be made to DOE for DOE approval of such licensing by the Contractor.

(4) Notwithstanding subparagraph (k)(3) of this clause, the contractor shall not be obligated to license any background patent if the Contractor demonstrates to the satisfaction of the Secretary of Energy or designee that:

(i) a competitive alternative to the subject matter covered by said background patent is commercially available or readily introducible from one or more other sources; or

(ii) the Contractor or its licensees are supplying the subject matter covered by said background patent in sufficient quantity and at reasonable prices to satisfy market needs, or have taken effective steps or within a reasonable time are expected to take effective steps to so supply the subject matter.

(l) Publication. It is recognized that during the course of the work under this contract, the Contractor or its employees may from time to time desire to release or publish information regarding scientific or technical developments conceived or first actually reduced to practice in the course of or under this contract. In order that public disclosure of such information will not adversely affect the patent interests of DOE or the Contractor, patent approval for release of publication shall be secured from Patent Counsel prior to any such release or publication.

(m) Forfeiture of rights in unreported subject inventions.

(1) The Contractor shall forfeit and assign to the Government, at the request of the Secretary of Energy or designee, all rights in any subject invention which the Contractor fails to report to Patent Counsel within six months after the time the Contractor:

(i) Files or causes to be filed a United States or foreign patent application thereon; or

(ii) Submits the final report required by subparagraph (e)(2)(ii) of this clause, whichever is later.

(2) However, the Contractor shall not forfeit rights in a subject invention if, within the time specified in subparagraph (m)(1) of this clause, the Contractor:

(i) Prepares a written decision based upon a review of the record that the invention was neither conceived nor first actually reduced to practice in the course of or under the contract and delivers the decision to Patent Counsel, with a copy to the Contracting Officer; or

(ii) Contending that the invention is not a subject invention, the Contractor nevertheless discloses the invention and all facts pertinent to this contention to the Patent Counsel, with a copy to the Contracting Officer; or

(iii) Establishes that the failure to disclose did not result from the Contractor's fault or negligence.

(3) Pending written assignment of the patent application and patents on a subject invention determined by the Secretary of Energy or designee to be forfeited (such determination to be a final decision under the Disputes clause of this contract), the Contractor shall be deemed to hold the invention and the patent applications and patents pertaining thereto in trust for the Government. The forfeiture provision of this paragraph (m) shall be in addition to and shall not supersede other rights and remedies which the Government may have with respect to subject inventions.

(End of clause)

Attachment 1: 952.227-11 Patent Rights - Retention by the Contractor (short form)

PATENT RIGHTS - RETENTION BY THE CONTRACTOR (SHORT FORM) (FEB 1995)

(a) Definitions.

(1) "Invention" means any invention or discovery which is or may be patentable or otherwise protectable under title 35 of the United States Code, or any novel variety of plant which is or may be protected under the Plant Variety Protection Act (7 U.S.C. 2321, et seq.).

(2) "Made" when used in relation to any invention means the conception of first actual reduction to practice of such invention.

(3) "Nonprofit organization" means a university or other institution of higher education or an organization of the type described in section 501(c)(3) of the Internal Revenue Code of l954 (26 U.S.C. 501(c)) and exempt from taxation under section 501(a) of the Internal Revenue Code (26 U.S.C. 501(a)) or any nonprofit scientific or educational organization qualified under a state nonprofit organization statute.

(4) "Practical application" means to manufacture, in the case of a composition or product; to practice, in the case of a process or method; or to operate, in the case of a machine or system; and, in each case, under such conditions as to establish that the invention is being utilized and that is benefits are, to the extent permitted by law or Government regulations, available to the public on reasonable terms.

(5) "Small business firm" means a small business concern as defined at section 2 of Pub. L. 85-536 (15 U.S.C. 632) and implementing regulations of the Administrator of the Small Business Administration. For the purpose of this clause, the size standards for small business concerns involved in Government procurement and subcontracting at 13 CFR 121.3-8 and 13 CFR 121.3-12, respectively, will be used.

(6) "Subject invention" means any invention of the contractor conceived or first actually reduced to practice in the performance of work under this contract, provided that in the case of a variety of plant, the date of determination (as defined in section 41(d) of the Plant Variety Protection Act, 7 U.S.C. 2401(d)) must also occur during the period of contract performance.

(7) "Agency licensing regulations" and "agency regulations concerning the licensing of Government-owned inventions" mean the Department of Energy patent licensing regulations at 10 CFR Part 781.

(b) Allocation of principal rights. The Contractor may retain the entire right, title, and interest throughout the world to each subject invention subject to the provisions of this clause and 35 U.S.C. 203. With respect to any subject invention in which the Contractor retains title, the Federal Government shall have a nonexclusive, nontransferable, irrevocable, paid-up license to practice or have practiced for or on behalf of the United States the subject invention throughout the world.

(c) Invention disclosure, election of title, and filing of patent application by Contractor.

(1) The Contractor will disclose each subject invention to the Department of Energy (DOE) within 2 months after the inventor discloses it in writing to Contractor personnel responsible for patent matters. The disclosure to DOE shall be in the form of a written report and shall identify the contract under which the invention was made and the inventor(s). It shall be sufficiently complete in technical detail to convey a clear understanding to the extent known at the time of the disclosure, of the nature, purpose, operation, and the physical, chemical, biological or electrical characteristics of the invention. The disclosure shall also identify any publication, on sale or public use of the invention and whether a manuscript describing the invention has been submitted for publication and, if so, whether it has been accepted for publication at the time of disclosure. In addition, after disclosure to the DOE, the Contractor will promptly notify that agency of the acceptance of any manuscript describing the invention for publication or of any on sale or public use planned by the Contractor.

(2) The Contractor will elect in writing whether or not to retain title to any such invention by notifying DOE within 2 years of disclosure to DOE. However, in any case where publication, on sale or public use has initiated the l-year statutory period wherein valid patent protection can still be obtained in the United States, the period for election of title may be shortened by DOE to a date that is no more than 60 days prior to the end of the statutory period.

(3) The Contractor will file its initial patent application on a subject invention to which it elects to retain title within 1 year after election of title or, if earlier, prior to the end of any statutory period wherein valid patent protection can be

obtained in the United States after a publication, on sale, or public use. The Contractor will file patent applications in additional countries or international patent offices within either 10 months of the corresponding initial patent application or 6 months from the date permission is granted by the Commissioner of Patents and Trademarks to file foreign patent applications where such filing has been prohibited by a Secrecy Order.

(4) Requests for extension of the time for disclosure, election, and filing under subparagraphs (c)(l), (2), and (3) of this clause may, at the discretion of the agency, be granted.

(d) Conditions when the Government may obtain title. The Contractor will convey to the Federal agency, upon written request, title to any subject invention--

(1) If the Contractor fails to disclose or elect title to the subject invention within the times specified in paragraph (c) of this clause, or elects not to retain title; provided, that DOE may only request title within 60 days after learning of the failure of the Contractor to disclose or elect within the specified times.

(2) In those countries in which the Contractor fails to file patent applications within the times specified in paragraph (c) of this clause; provided, however, that if the Contractor has filed a patent application in a country after the times specified in paragraph (c) of this clause, but prior to its receipt of the written request of the Federal agency, the Contractor shall continue to retain title in that country.

(3) In any country in which the Contractor decides not to continue the prosecution of any application for, to pay the maintenance fees on, or defend in reexamination or opposition proceeding on, a patent on a subject invention.

(e) Minimum rights to Contractor and protection of the Contractor right to file.

(1) The Contractor will retain a nonexclusive royalty-free license throughout the world in each subject invention to which the Government obtains title, except if the Contractor fails to disclose the invention within the times specified in paragraph (c) of this clause. The Contractor's license extends to its domestic subsidiary and affiliates, if any, within the corporate structure of which the Contractor is a party and includes the right to grant sublicenses of the same scope to the extent the Contractor was legally obligated to do so at the time the contract was awarded. The license is transferable only with the approval of the Federal agency, except when transferred to the successor of that part of the Contractor's business to which the invention pertains.

(2) The Contractor's domestic license may be revoked or modified by DOE to the extent necessary to achieve expeditious practical application of subject invention pursuant to an application for an exclusive license submitted in accordance with applicable provisions at 37 CFR Part 404 and agency licensing regulations. This license will not be revoked in that field of use or the geographical areas in which the Contractor has achieved practical application and continues to make the benefits of the invention reasonably accessible to the public. The license in any foreign country may be revoked or modified at the discretion of DOE to the extent the Contractor, its licensees, or the domestic subsidiaries or affiliates have failed to achieve practical application in that foreign country.

(3) Before revocation or modification of the license, DOE will furnish the Contractor a written notice of its intention to revoke or modify the license, and the Contractor will be allowed 30 days (or such other time as may be authorized by DOE for good cause shown by the Contractor) after the notice to show cause why the license should not be revoked or modified. The Contractor has the right to appeal, in accordance with applicable regulations in 37 CFR Part 404 and agency regulations concerning the licensing of Government owned inventions, any decision concerning the revocation or modification of the license.

(f) Contractor action to protect the Government's interest.

(1) The Contractor agrees to execute or to have executed and promptly deliver to DOE all instruments necessary to (i) establish or confirm the rights the Government has throughout the world in those subject inventions to which the Contractor elects to retain title, and (ii) convey title to DOE when requested under paragraph (d) of this clause and to enable the government to obtain patent protection throughout the world in that subject invention.

(2) The Contractor agrees to require, by written agreement, its employees, other than clerical and nontechnical employees, to disclose promptly in writing to personnel identified as responsible for the administration of patent matters and in a format suggested by the Contractor each subject invention made under contract in order that the Contractor can comply with the disclosure provisions of paragraph (c) of this clause, and to execute all papers necessary to file patent applications on subject inventions and to establish the Government's rights in the subject inventions. This disclosure format should require, as a minimum, the information required by subparagraph (c)(1) of this clause. The Contractor

shall instruct such employees, through employee agreements or other suitable educational programs, on the importance of reporting inventions in sufficient time to permit the filing of patent applications prior to U.S. or foreign statutory bars.

(3) The Contractor will notify DOE of any decision not to continue the prosecution of a patent application, pay maintenance fees, or defend in a reexamination or opposition proceeding on a patent, in any country, not less than 30 days before the expiration of the response period required by the relevant patent office.

(4) The Contractor agrees to include, within the specification of any United States patent application and any patent issuing thereon covering a subject invention, the following statement, "This invention was made with Government support under (identify the contract) awarded by the United States Department of Energy. The Government has certain rights in the invention."

(g) Subcontracts.

(1) The Contractor will include this clause, suitably modified to identify the parties, in all subcontracts, regardless of tier, for experimental, developmental, or research work to be performed by a small business firm or domestic nonprofit organization. The subcontractor will retain all rights provided for the Contractor in this clause, and the Contractor will not, as part of the consideration for awarding the subcontract, obtain rights in the subcontractor's subject inventions.

(2) The contractor shall include in all other subcontracts, regardless of tier, for experimental, developmental, demonstration, or research work the patent rights clause at 952.227-13.

(3) In the case of subcontracts, at any tier, DOE, subcontractor, and the Contractor agree that the mutual obligations of the parties created by this clause constitute a contract between the subcontractor and DOE with respect to the matters covered by the clause; provided, however, that nothing in this paragraph is intended to confer any jurisdiction under the Contract Disputes Act in connection with proceedings under paragraph (j) of this clause.

(h) Reporting on utilization of subject inventions. The Contractor agrees to submit, on request, periodic reports no more frequently than annually on the utilization of a subject invention or on efforts at obtaining such utilization that are being made by the Contractor or its licensees or assignees. Such reports shall include information regarding the status of development, date of first commercial sale or use, gross royalties received, by the Contractor, and such other data and information as DOE may reasonably specify. The Contractor also agrees to provide additional reports as may be requested by DOE in connection with any march-in proceeding undertaken by that agency in accordance with paragraph (j) of this clause. As required by 35 U.S.C. 202(c)(5), DOE agrees it will not disclose such information to persons outside the Government without permission of the Contractor.

(i) Preference for United States industry. Notwithstanding any other provision of this clause, the Contractor agrees that neither it nor any assignee will grant to any person the exclusive right to use or sell any subject invention in the United States unless such person agrees that any product embodying the subject invention or produced through the use of the subject invention will be manufactured substantially in the United States. However, in individual cases, the requirement for such an agreement may be waived by DOE upon a showing by the Contractor or its assignee that reasonable but unsuccessful efforts have been made to grant licenses on similar terms to potential licensees that would be likely to manufacture substantially in the United States or that under the circumstances domestic manufacture is not commercially feasible.

(j) March-in rights. The Contractor agrees that, with respect to any subject invention in which it has acquired title, DOE has the right in accordance with the procedures in 37 CFR 401.6 and any supplemental regulations of the agency to require the Contractor, an assignee or exclusive licensee of a subject invention to grant a nonexclusive, partially exclusive, or exclusive license in any field of use to a responsible applicant or applicants, upon terms that are reasonable under the circumstances, and, if the Contractor, assignee, or exclusive licensee refuses such a request, DOE has the right to grant such a license itself if DOE determines that-- (1) Such action is necessary because the Contractor or assignee has not taken, or is not expected to take within a reasonable time, effective steps to achieve practical application of the subject invention in such field of use; (2) Such action is necessary to alleviate health or safety needs which are not reasonably satisfied by the Contractor, assignee, or their licensees; (3) Such action is necessary to meet requirements for public use specified by Federal regulations and such requirements are not reasonably satisfied by the Contractor, assignee, or licensees; or (4) Such action is necessary because the agreement required by paragraph (i) of this clause has not been obtained or waived or because a licensee of the exclusive right to use or sell any subject invention in the United States is in breach of such agreement.

(k) Special provisions for contracts with nonprofit organizations. If the Contractor is a nonprofit organization, it agrees that--

(1) Rights to a subject invention in the United States may not be assigned without the approval of the Federal agency, except where such assignment is made to an organization which has as one of its primary functions the management of inventions; provided, that such assignee will be subject to the same provisions as the Contractor;

(2) The Contractor will share royalties collected on a subject invention with the inventor, including Federal employee co-inventors (when DOE deems it appropriate) when the subject invention is assigned in accordance with 35 U.S.C. 202(e) and 37 CFR 401.10;

(3) The balance of any royalties or income earned by the Contractor with respect to subject inventions, after payment of expenses (including payments to inventors) incidental to the administration of subject inventions will be utilized for the support of scientific research or education; and

(4) It will make efforts that are reasonable under the circumstances to attract licensees of subject inventions that are small business firms, and that it will give a preference to a small business firm when licensing a subject invention if the Contractor determines that the small business firm has a plan or proposal for marketing the invention which, if executed, is equally as likely to bring the invention to practical application as any plans or proposals from applicants that are not small business firms; provided, that the Contractor is also satisfied that the small business firm has the capability and resources to carry out its plan or proposal. The decision whether to give a preference in any specific case will be at the discretion of the contractor. However, the Contractor agrees that the Secretary of Commerce may review the Contractor's licensing program and decisions regarding small business applicants, and the Contractor will negotiate changes to its licensing policies, procedures, or practices with the Secretary of Commerce when that Secretary's review discloses that the Contractor could take reasonable steps to more effectively implement the requirements of this subparagraph (k)(4).

(l) Communications.

(1) The contractor shall direct any notification, disclosure, or request to DOE provided for in this clause to the DOE patent counsel assisting the DOE contracting activity, with a copy of the communication to the Contracting Officer.

(2) Each exercise of discretion or decision provided for in this clause, except subparagraph (k)(4), is reserved for the DOE Patent Counsel and is not a claim or dispute and is not subject to the Contract Disputes Act of 1978.

(3) Upon request of the DOE Patent Counsel or the contracting officer, the contractor shall provide any or all of the following:

(i) a copy of the patent application, filing date, serial number and title, patent number, and issue date for any subject invention in any country in which the contractor has applied for a patent;

(ii) a report, not more often than annually, summarizing all subject inventions which were disclosed to DOE individually during the reporting period specified; or

(iii) a report, prior to closeout of the contract, listing all subject inventions or stating that there were none.

(End of clause)

DOE F 4600.2

U.S. Department of Energy

(09-92)
Replaces EIA-459A
All Other Editions are Obsolete

FEDERAL ASSISTANCE REPORTING CHECKLIST

1. Identification Number: 02-98EE50526	2. Program/Project Title: Fuel Cells for Transportation & Buildings, Compression Ignition Direct Injection Engines, & Fuels, & Lubricants

3. Recipient:

4. Reporting Requirements:	Frequency	No. of Copies	Addressees
PROGRAM/PROJECT MANAGEMENT REPORTING			
☐ DOE F 4600.3, "Federal Assistance Milestone Plan"			
☐ DOE F 4600.3A, "Milestone Log"			
☐ DOE F 4600.4, "Federal Assistance Budget Information"			
☒ Program Management Plan, (See Attachment 1)	Y	Orig + 2	Orig + 2cys, C
☐ DOE F 4600.6, "Federal Assistance Program/Project Status Report"			
☒ SF-269A, "Financial Status Report" Short Form	Q	Orig + 2	Orig B, C, D
TECHNICAL INFORMATION REPORTING			
☐ Biweekly Technical Progress Report			
☒ Technical Progress Report**	Y	Orig + 2	Orig + 2cys, B, C
☒ Topical Report**	A	Orig + 2	Orig + 2cys, B, C
☒ Final Technical Report**	F	Orig + 2	Orig + 2cys, B, C
☒ Review Meeting / Meeting Agenda-10 days prior to any meeting.	Q	Orig + 2	Orig + 2cys, C

FREQUENCY CODES AND DUE DATES:

A - As Necessary; within 5 calendar days after events.

F - Final; 90 calendar days after the performance of the effort ends.

Q - Quarterly; within 30 days after end of calendar quarter or portion thereof.

O - One time after project starts; within 30 days after award.

X - Required with proposals or the application or with significant planning changes.

Y - Yearly; 30 days after the end of program year. (Financial Status Reports 90 days).

S - Semiannually; within 30 days after end of program fiscal half year.

5. Special Instructions:

A. **All scientific, technical documents, and technical reports, i.e. quarterly, annual progress reports, periodic scientific, topical, final report, and conference papers shall be submitted with 2 copies of DOE Form 1332.15, Recommendations for the Announcement and Distribution of Department of Energy (DOE) Scientific and Technical Information (STI).

B. MAIL REPORTS TO: Original - Contracting Officer

U. S. Department Of Energy
Chicago Operations Office
9800 South Cass Avenue
Argonne, Illinois 60439

C. Donna Lee-Ho, EE-32
Department of Energy
1000 Independence Avenue, S.W.
Washington, D.C. 20585

D. Financial Services Group
Department of Energy
9800 S. Cass Avenue
Argonne, Illinois 60439

6. Prepared by: (Signature and Date)	7. Reviewed by: (Signature and Date)

PROGRAM MANAGEMENT PLAN GUIDELINES

The following guidelines indicate the information to be included and the format to be followed in preparing a Program Management Plan. As a minimum, the Program Management Plan shall contain the following sections.

1. Purpose of R&D Effort

   The applicant shall briefly describe the overall purpose, objectives and scope of the R&D effort describe in the plan.

2. Remaining Technology Development Areas

   The Applicant shall clearly outline the remaining problem areas in technology development in a few descriptive paragraphs. These areas will be described in order of importance and priority.

3. Description of Tasks

   The applicant shall provide a detailed work breakdown structure (WBS) defining different areas of activity as discrete tasks and the interrelation among the tasks. A written description of each task including objective, planned activities and clearly defined milestones shall also be provided. The applicant shall also provide a manpower plan by task and month, and a cost plan by task and month.

4. Schedule

   The applicant shall prepare a baseline detailed activity schedule (critical path network schedule or equivalent). Include major milestones.

5. Reports to be Delivered

   The applicant shall provide a description of the reports to be supplied under the agreement and provide a schedule of their delivery dates and quantities.

6. Hardware/ Final Report to be Delivered

   The applicant shall provide a description of the technology to be demonstrated in each of the delivered hardware/report. He shall also provide a schedule of quantities and planned delivery dates of these items.

CHECKLIST

Applicant: _____

Topic: _____

Subtopic: _____

Please complete the checklist and paper clip (one copy only) to the cover sheet of the original (signed) copy of the assistance application.

DOES THE APPLICATION SATISFY THE FOLLOWING REQUIREMENTS:

		Yes	No
√	Minnimum cost sharing requirements have been met and only one topic is covered under each application submitted.	€	
√	Both endorsements on face page completed and signed.		
√	Scope of Work contains no proprietary information.		
√	Main text (technical content) is included as requested in Subsection 2.5.2.		
√	Application does not exceed 25 pages. See Section 2.5 for information excluded from the 25-page limitation.	☐	☐
√	No pages other than 8 1/2" x 11".		
√	No type smaller than (1) 12 points for proportionally spaced fonts and (2) 12 characters per inch (elite) for non-proportionally spaced fonts.		
√	All Certifications are completed and signed by an authorized r epresentative of the applicant's company.		